Extracting spatial data from historic artwork of Hobart and its region

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Declaration

"This dissertation contains no material which has been accepted for another degree by the University of Tasmania or any other institution, except by way of background information and duly acknowledged in the thesis. To the best of my knowledge and belief no material previously published or written by another person is contained in the thesis except where due acknowledgement is made in the text, nor does the thesis contain any material that infringes copyright."

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Abstract

The integration of spatial techniques with art can potentially provide information on past environments and culture. Nineteenth century landscape artwork from Hobart was examined to assess the accuracy of artists by applying photogrammetric techniques. Four prominent artists of the time, each from different backgrounds, varied markedly in their accuracy of depiction of landscapes. Computation of areas on artworks dedicated to features, such as forests, sky and fields, highlighted the significance of the social background and profession of the artist in composition. While gender did not affect the feature composition of works, the media used by 19th century females were restricted to drawing and water colour. To demonstrate the potential for integration of historical and spatial processes, forest clearance boundaries were mapped and dated from raw data of 19th Century paintings and photographs and later aerial photographs.

Keywords: Historical artwork, features, spatial analysis, Hobart region.

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Contents

List of Tables

List of Figures

Chapter 1. Introduction

1.1 Introduction

Landscape art is the scene within the range of the observer's vision (Rose 1993, p. 172). As a form of art it refers to the depiction of nature (Gilpin 1972; Clark 1956; Cosgrove 1993; Carlson 2005; Tuan 2013), encompassing features such as mountains, trees, forest, rocks and rivers, as well as the artefacts and outcomes of human activity, exemplified in infrastructure and agricultural land use. Paintings provide insights into past places at a level of detail that is unavailable through literature (Norstrom and Jackson 2001).

The present study, through an integration of empirical and theoretical approaches, utilises the natural and man-made features depicted in landscape artworks to offer a perspective on the past (Mitchell 2002, p. 18). It is well understood that historical artworks provide a valuable source of data on past environments (Mitchell 2000, p. 16; Osborne 1988, p. 162), landforms and the exploitation of local resources (Norstrom and Jackson 2001).

In addition to varied portrayals of the same landscape by different artists, the landscape itself is also varied. Landscape, broadly conceived, is'an area as perceived by people, whose character is the result of the action and interaction of natural and/or human factors' (Council of Europe 2000). According to Eckbo (1967), the conceptualised landscape can be classified into: the social landscape, which refers to the region in which people interact; the physical landscape, which comprises natural and man-made elements; the economic landscape, which refers to the material progress or regression of society; and, the cultural landscape, which is a product of orientation and contribution over time by people.

From an aesthetic perspective, the landscape as scenery comprises variation in landforms and their covers (Cosgrove 1984; Ervin 2001), exemplified in mountains, valleys and water bodies (Andrews 1999). However, there is also the human impact of development and change through land use (Elerie and Spek 2010).

McLoughlin (1999) presents evidence of the effects of fire on the landscape in both the pre-European and post-settlement periods in the Sydney region. Also within Australia, Gaynor and McLean (2008) have assessed past ecology using historical artwork depicting the Swan River area of Western Australia. They found that the artwork was consistent with current ecological knowledge.

Knowledge of past land use is useful for management and planning for the future (Wilson 1991, p.303; Westerink 2010 in Nilsson et al 2013, p.111). For example, Antrop (2005) highlights the significance of the composition of elements that form the landscape from a planning perspective, based on reconstructions from paintings.

Unlike photographs that seemingly provide faithful representation of a scene (Barthes 1981; Snyder 2002; Well 2011, p. 56), artworks are fabrications of the human mind (Elkins 1999, p. 188; Fairbairn 2009a; Staple 2003, p. 313), subject to interpretation by artistic license (Barnard 1871; Jakle 1987; Halkes 2006; Fairbairn 2009b).

Despite the problem of artistic license, many historic artworks have been used in environmental reconstructions (de Boer et al 2011). If topographic features can be recognised in the present day landscape, the depiction of the rest of the landscape is assumed to be reliable (McLoughlin 1999; Norstrom and Jackson 2001). In other cases, a painting is judged to be ecologically accurate if the ecological relationships

it depicts are consistent with present ecological knowledge (Gaynor and McLean 2008).

While McLoughlin (1999) used topography and vegetation to assess accuracy, this was not done in a quantitative manner. In a geometrical sense, the accuracy of the spatial location of the features depicted is significant in determining accuracy of the thematic content (de Boer 2010). Displaying geographic data on a flat surface usually results in the distortion of elements (Goodchild 2008, p. 180). In art, proportions of the features may be adjusted by the artist (Clark 1956; Campbell 2005). Colours, shades and tones would reflect the mood of the artist (Dewey 1934, p 91), with the familiar palette of their origin. Prior to application of spatial analysis techniques to draw conclusions concerning the content of landscape art, intention and interests of the artist must be considered.

Some attempts have been made to extract spatial data from a single image, particularly utilising modern software applications (Patias 2004). Fairbairn (2009b) examines the accuracy of projective geometry in a historic painting using a software called PhotoModeler[1], a 3D photogrammetric application that is used to reconstruct dimensional objects from photographs. Coordinates of three corners of a building were determined in the horizontal plane from maps and in the third dimension a height of a tower located vertically above one of the horizontal points was provided. On this basis the geometry of the depiction was investigated as a perspective view by extending lines from control to other known points. No accuracy measures are

[1] http://www.photomodeler.com/products/why.html

provided, but the authors acknowledge inconsistencies at an unacceptable level that are due to poor geometrical condition of the scene given the low elevation of the artist and distance from the building. Similar inaccuracy was obtained by Fairbairn (2009b) using Google SketchUp. This software application requires two coordinates to give scale and orientation to the image, then parallel lines are drawn to establish vanishing points in the perspective image. It is ideally suited to geometrical features such as buildings where parallel lines are readily available. The resulting image is then reduced to plan form and compared with the true footprint of the building. Once again the plan contained a high degree of spatial error, which is attributed to inaccuracies in the perspective of the painting.

Appreciation of nature may be influenced by individual social background as well as the historical circumstances (Campbell 2005; Hindmarch 2002). In the 19th century in Hobart, artists came from a variety of backgrounds including convicts, professionals and amateurs from different professions. Their different perspectives on the world and their surroundings may be expressed in their artistic interpretation. In addition to assessment of accuracy of portrayal through spatial analysis of the art work in comparison with the scene, the types of work that they chose to portray through features incorporated may also offer an indication of mood (Brady 2003, p 72), with some selected features being enhanced in detail or in scale.

Technically, the spatial data inherent in landscape artworks is important (Fairbairn 2009a). Such data are represented in form of dots/points, lines, and polygons or a combination of all (Peuquet 1984; Gotway and Young 2002; Barrett 2011). In this regard, assessment of the utility of appropriate techniques that offer tools capable of

manipulation and extraction of spatial data from images is necessary. Within Geographical Information Systems (GIS) there is a capacity for spatial representation and analysis (Burrough 2001; Padilla 2008; de Boer at al. 2010). GIS applications and computer graphic tools can be utilised in an attempt to reconstruct historical landscape using maps, drawings and paintings (de Boer 2010).

Having identified landscape scenes that may be accepted as suitably accurate representations of reality, the transformation of a two dimensional isometric view into plan form with features accurately presented is beyond normal photogrammetric methods. These methods require stereo pairs of images to offer a three dimensional perspective. Google Earth, however, provides an alternative that offers a novel approach to solve the problem (Kramer et al 2011). Landscape that is presented initially in plan form can also be viewed in isometric form, hence overlaid on artwork and restored to its initial plan with coordinates to a suitable degree of accuracy for geographical purposes. GIS is then the accepted tool for support of further spatial interpretation.

1.2 Aim and Objectives

The ultimate aim of this research is to extract geographical information from landscape artworks. In addition, the selected site for the study provides opportunity to articulate class relations through evaluation of the artists, and means of developing a national identity, a conduit for the experience of colonial power (Adams and Robins 2000, p. 1). The present work extends previous research, which has typically subjectively assessed the content of landscape art, by quantifying landscape patterns to allow accurate reconstructive mapping.

The specific objectives of the thesis are

1.2.1 *To assess the accuracy of historical landscape pictures produced by different artists.* Parameters for the perspective of artworks are utilized to assess the relative location of features. Through redundancy in the number of features selected to make the assessment, a measure of accuracy is obtained.

1.2.2 *To assess the distinctiveness of work by different artists of different backgrounds and gender.* This objective is attained through analysing the scenes that artists decided to represent in the context of their personal situations. The background of each artist is researched and compared with the scenes available at the locations from which they produced their work. Further research on individual characteristics of artists is assessed through features included in their depictions. Features are classified and proportions of each contained within each piece of their work are evaluated statistically in relation to social status to identify trends by background.

1.2.3 To demonstrate an application of spatial techniques to a geographic problem. Land clearance was of particular interest with hillside deforestation and re-vegetation providing a theme of significance for the study area. In addition to using the limited amount of landscape art available, this component also uses photographs, a development that was introduced within the period of interest. Later aerial photographs are used for comparison as well as validation.

1.3 Study Area

The area selected for the investigation covers the city of Hobart and its region. Hobart, previously known as Hobarton, is located at the Sullivan's Cove, on the

western side of the River Derwent in Tasmania (Figure 1.1). The city was established in 1804 under Lieutenant Governor David Collins (1756-1810), as an English colony (Evans 1822; Plowman 2004). In 1812 Hobart became the capital of Tasmania (Scott 1955). A previous attempt to establish a settlement by Lieutenant Bowen, at Risdon Cove on the eastern side the River Derwent, had failed due to an inadequate water supply (Scott 1955; Plowman 2004, p. 9).

Hobart is situated at the base of Mount Wellington with a regular supply of fresh water from the rivulets, which originate in the adjacent mountains. Fertile soils and rich grasslands promoted farming in the region. Agricultural activities were important for the development of this new colony.

Convicts and the military personnel needed to oversee convict labour and defend the new territory were accommodated in Hobart (Boyce 2008, p. 52; Atkinson 2005, p. 98). In the 1820's, the colony was promoted as a location for free settlers (Evans 1822 and Whyte 2004, p. 282). The settlers arrived from various parts of Britain and its territories[2]. Free settlers further developed agriculture around Hobart, clearing much land.

Transportation of goods by sea through Hobart on the banks of the River Derwent led to further development of the city. Eventually Hobart became the focus of industry and agricultural activities (Morgan 1992, Paull, 2011, p. 154; Plowman 2004), and the location where most of the pioneering artists landed.

[2] More details available at <http://australia.gov.au/about-australia/australian-story/convicts-and-the-british-colonies>.

During the 19th century artists from a wide range of backgrounds passed through the city. Their work showed the progress of industry and changes to the surrounding landscape including the native forest. Professional artists largely migrated for reasons other than their art, but they continued to paint. Their work paved the way for emerging artists within the growing colony. The earliest known landscape painting in Hobart was produced in 1804. While it is unsigned, its style suggests George William Evans (1780-1852), the surveyor[3].

Modification for urbanization and agriculture involved clearance of vegetation, deforestation, land reclamation and mining. To encourage migration and to attract investors to the colony, the progress of development, among the naturally picturesque, was depicted in artwork for promotion of the island in Britain (Auerbach 2004; Walker 2008).

Artwork produced by individuals from diverse strata of society including convicts, government workers and professional artists provide a record of development of the settlement. Those records are now significant from a geographical perspective in terms of landscape change.

The conceptual framework of this study is based on the principle that artists depicted the essential characteristics of landscape. Nineteenth Century Hobart is ideally suited to a study of the utility of spatial analysis of artworks for historical geographic reconstruction. Van Diemen's Land (now Tasmania) was a new colony

[3] http://acms.sl.nsw.gov.au/item/itemDetailPaged.aspx?itemID=441875.

with migrants coming from many different locations and backgrounds, at a time in which landscape art was a major form of communication and advertising.

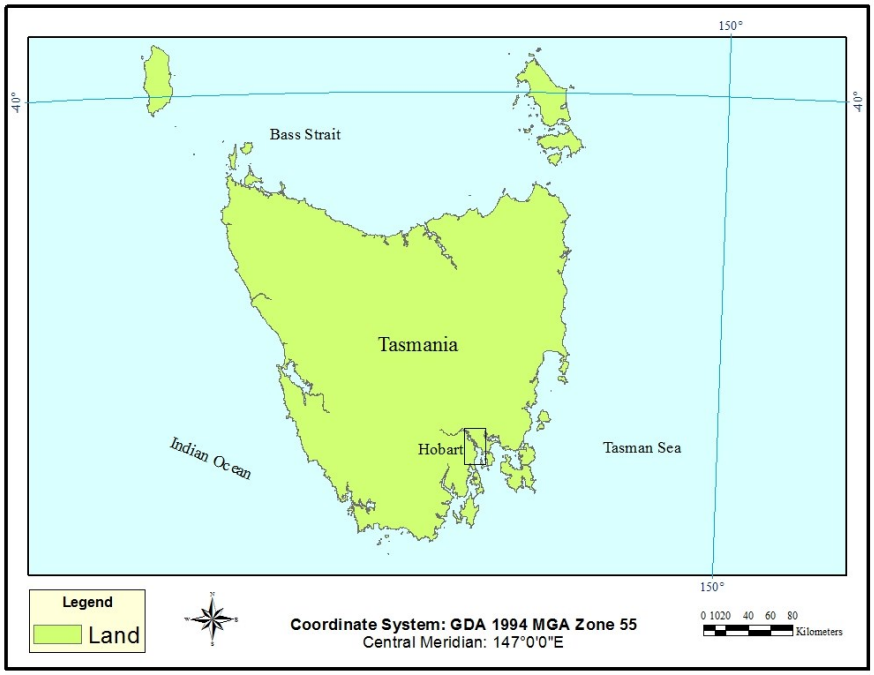

Figure 1.1: Location of the study area of Hobart.

1.4 Data Acquisition

A search was undertaken for the selection of suitable images of landscape artworks that depicting the area of interest, Hobart and its region, in the 19th century. There are numerous digital copies of historical documents including written records and artworks that are available at the Tasmanian archive and heritage Office (TAHO) for download for research purposes. For this research 175 image were selected, which were produced by 57 different artists, the sites or the geographic locations that artist used to capture the scene were defined and mapped (Figure 1.2).

The study area encompasses the geographic views depicted by artists, which extended from Richmond and Roseneath in the north to Kangaroo Point in the east, to Blackmans Bay in the south and to Mount Wellington and its ranges in the west.

Artworks available online in digital format were provided by the Tasmania State Library through online service provided by LINC Tasmania, for research purposes. The wide network of LINC Tasmania allows access to archived historical information including images, photographs, maps as well as contemporary records. Other images were acquired from materials produced for exhibitions (Kolenberg and Kolenberg 1987; Hansen 2003; Hunter 2003). Maps presented in this study were created using ArcMap applications.

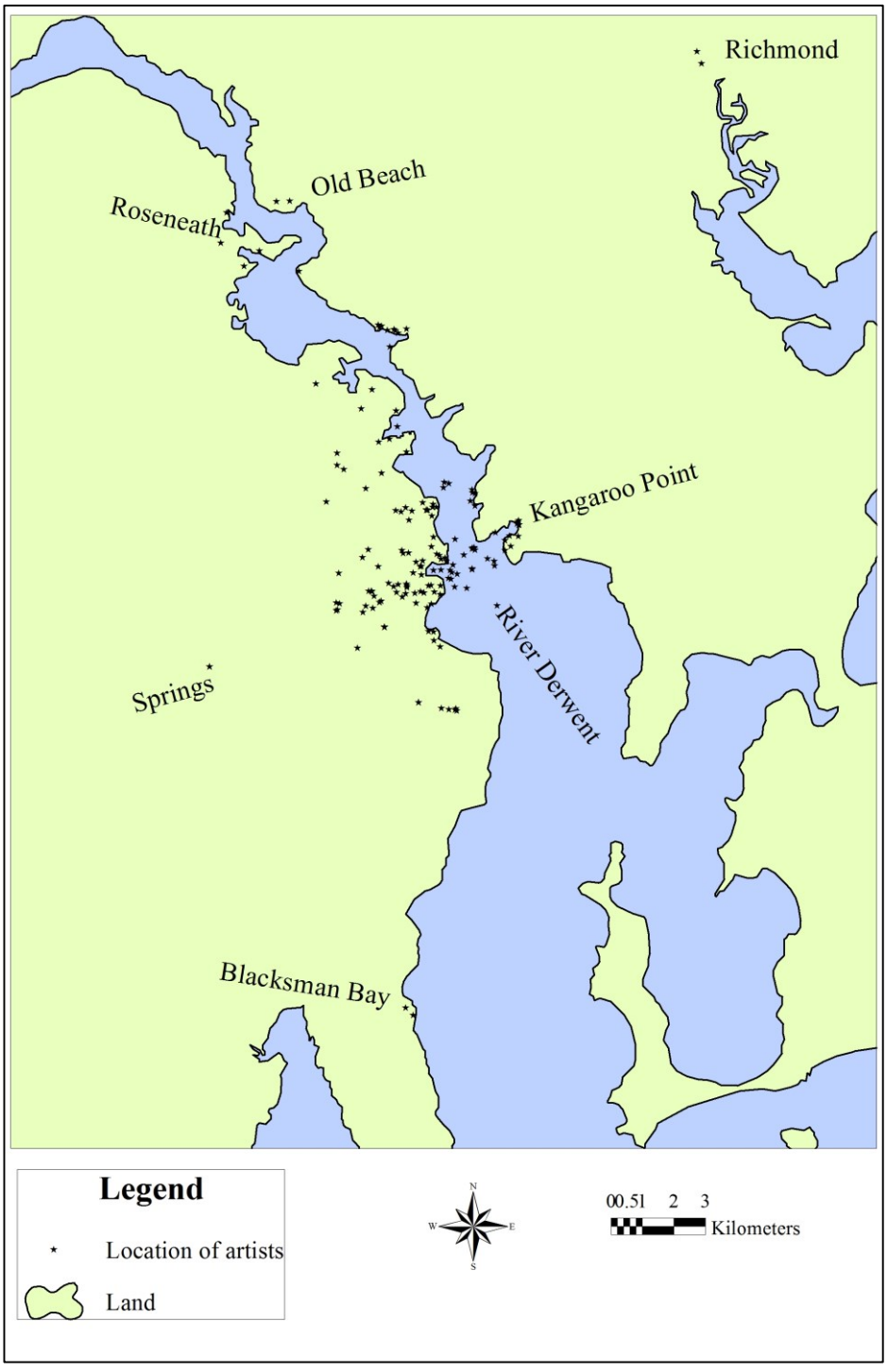

Figure 1.2: Distribution of points/locations used by artists to produce artworks.

1.5 Organization of Chapters

Using artworks produced by a representative selection of artists from different backgrounds, chapter two presents the application of photogrammetric methods to determine their accuracy in production of landscape artworks.

In chapter three statistical techniques were used to assess relationships of social background, profession, gender and class of the artist, with location of scene selection and other attributes of his or her work. For this purpose, the period of one century under investigation is broken into three eras. Such division of time provided the basis for the proceeding section.

In Chapter four, the application of quantitative methods to examine whether the background and profession of artists had influences on the selection of features, and also examines the influence of gender in the 19th century English society of Tasmania. Finally, having identified a suitable selection of works, chapter five addresses the use of artworks in the extraction of historical geographical information. Forest clearance is used as the example with the extraction of boundaries being used in GIS for mapping change detection (forest known as bushland in Tasmania)[4]. Spatial data from historic artworks and photographs are compared with data from aerial photographs of mid-20th century and map of 2008. In chapter six the conclusions and proposals for further investigation are presented.

[4] http://www.hobartcity.com.au/Recreation/Bushland.

Chapter 2. Determining the Accuracy of Historical Landscape Paintings

2.1 Introduction

In studying climatic events, Austin (2014) has demonstrated that artwork can be a valuable resource for understanding past environments, although artists did not necessarily project exact reality to their audiences. In the study of climate, care must be taken in selecting artists who faithfully reproduced colours. Artists are known to exercise license in repositioning and reshaping features with subjective intentions (Nordstrom and Jackson 2001; Haynes 2003, p. 92). In this chapter, the artistic license is investigated numerically through the use of photogrammetric techniques, which are applied to the problem of determining the accuracy of artists in depiction of landscapes. To evaluate the techniques, four pictures created by different artists were used. The artists came from different social background, class and place.

Prior to the development of photography, artists provided visual records of lifestyle, development and natural scenes. Artworks were used as a mean of attraction of migrants and tourists (Jordan 2002; Walker 2008). Landscape paintings have proven to be highly useful for many purposes, including reconstructing vegetation patterns (Fensham, 1989; Kirkpatrick, 2007), climatic conditions (e.g., Neuberger 1970; Robinson 2005) and cultural traditions (Kairan and Woudstra 2010; Jordan 2002).

Historical paintings can provide a record so accurate that it is possible to deduce dates and times from the locations of sun and shadows in the image (Baker and Thornes 2006). However, landscape artists were not all trying to create a facsimile of

a view. Many landscape artists produced a number of sketches of the same scene taken from different perspectives, and used these sketches to produce a composed piece rather than an exact portrait of the scene (Bartlett 1982; Fischer 2008), making their sketches more valuable for reconstruction than their paintings.

The work of Baker and Thornes (2006) provided an example of the extraction of information from landscape paintings using quantitative techniques. In gaining both qualitative and quantitative information from landscape paintings it is important to determine whether artists distorted reality in order to improve aesthetics, and in what manner this distortion occurs. If the distortion is systematic, the picture can still be used for quantitative purposes. For example, if the sole distortion was vertical exaggeration, measurements could easily be adjusted. It may be that part of a picture is true to the past landscape, while another part has been adjusted for artistic reasons. Georeferencing of an image is undertaken through use of identifiable features that can be coordinated in the real world, such control points need to be distributed across the image to identify and overcome problems with exaggeration and distortion.

In this chapter a photogrammetric method applied for determining the degree of distortions in landscape paintings. This approach was applied to work by four artists that seem to differ in level of accuracy, thus distortion of reality.

2.2 Artists in 19th century Tasmania

Early developments of Tasmania were frequently depicted by landscape artists. While much of their work was destined for private sale, it was also widely used to attract immigrants and tourists. In some parts of the world, artists produced picturesque painting of places because they were attracted to them as tourists (Bate

2000). In a newly colonised Tasmania, the tourists and immigrants were to be attracted by picturesque paintings (Walker 2008; Andrews 1989). However, not all landscape art was produced by professional painters. Artists were also among the officials whose jobs involved exploring the island for purpose of surveying and creating maps (Jones 2010). Others were military officers whose role was to assess the terrain for strategic purposes, these officials may have been more accurate than the professional artists in their depiction of landscapes.

An examination of works by four artists is undertaken, with each having a different style and different course of artistic development. All settled in Tasmania around the mid of nineteenth century and depicted landscape scenes of Hobart. The artists include Frederick Strange (1807-1873), Henry Gritten (1818-1873), George Frankland (1800-1838) and John Glover (1767-1849). Strange was convicted for stealing a watch and transported to Hobart in 1838. In 1841, on gaining a third class pardon, he moved to Launceston, taught art, produced portraits and painted the occasional landscape (Craig and Mead 1963). By obtaining a ticket of leave in 1848, Strange moved to Hobart where he depicted local scenes. However, three years later, the artist returned to Launceston to practice art as a profession. Little is known about his life prior to transportation, but it is unlikely that he received any formal training as an artist.

Gritten was a trained artist and a photographer (Kolenberg and Kolenberg 1988). During the 1830's and 1840's he travelled through Europe, painting views of towns, rivers, the sea and various aspects of nature. A selection of his work, in water colour and oil, was exhibited at Royal Academy and at the British Institute and at other art

galleries in London. By 1850 Gritten travelled to America where he painted aesthetic scenes including the Catskill Mountains, west of the Hudson River, and then he moved on to Tasmania. Most notable is the artists' depiction of Mount Wellington that extends across the backdrop of the city of Hobart, by implication the scene suggests use of the mountain for attraction of tourists (Conrad 2004, p. 150) as it does today. Later in his career as a photographer, Gritten used the new technology to enhance his organisation of natural scenes and, thus, depiction of the landscape. It is likely that he painted from photographs.

Frankland was born in Somerset, England. He was appointed first assistant surveyor of Tasmania, landed in Hobart in 1827, and became chief surveyor in 1828 (Alan 1989). As a professional working with spatial data his artistic depictions of landscape using water colour and pencil could be expected to be more accurate than others. Glover was born in Leicestershire, England and grow up on a farm (Hindmarch 2002, p. 2). Arguably, as an established artist in his homeland (Lien 2007, p.108; Short 1991), at 63 of age he migrated to Tasmania. Glover with his family arrived in Hobart in 1831 (Kolenberg and Kolenberg 1988; Hindmarch 2002). Being a romantic landscape artist (Hansen 2003), he could be expected to have modified the real world to satisfy aesthetic ideals.

2.3 Methods

For determining location and the spatial distortion, the technique developed was based on the assumption that the major topographic elements of the landscape have not changed since the 19th century. The western shore of the Derwent River was

excluded from this assumption due to development and land reclamation over the years.

Defining the location, from which a scene was captured, is important in any study that utilises images of landscape (e.g., Cimini and Masscci 2003; Julio, Lorenzo and Francisco 2004; Ode and Miller 2011; Roth 2006; Yoin et al 2011; Cengiz 2014). Cengiz (2014) stressed that the selection of the location of the artist should be carefully identified for a valid analysis. However, over a wide area of terrain, it is impossible to traverse the entire region trying to identify approximate locations from which artists produced their work. Therefore, the methodology made use of the terrain view in Google Earth. The viewer is located at the approximate position of artist and where features portrayed in the painting can be seen from one single viewpoint, allowing coordinates of the features in the real world to be obtained. Measurements taken from the paintings are extracted from a scanned image using a drawing package with dimensions rescaled to those of the original painting. Data are then available for geometrical analysis.

In this research, natural and human-made features were used to geo-reference points portrayed in art work. The geometry of the location of the artist, painting and scene are shown in Figure 2.1, with the artist located at focal point P, having coordinates E, N and U. Point P in the scene with coordinates e_p, n_p and u_p is represented as P' (e_p', n_p' and u_p') in the painting with rays from the scene passing through the painting to the focal point.

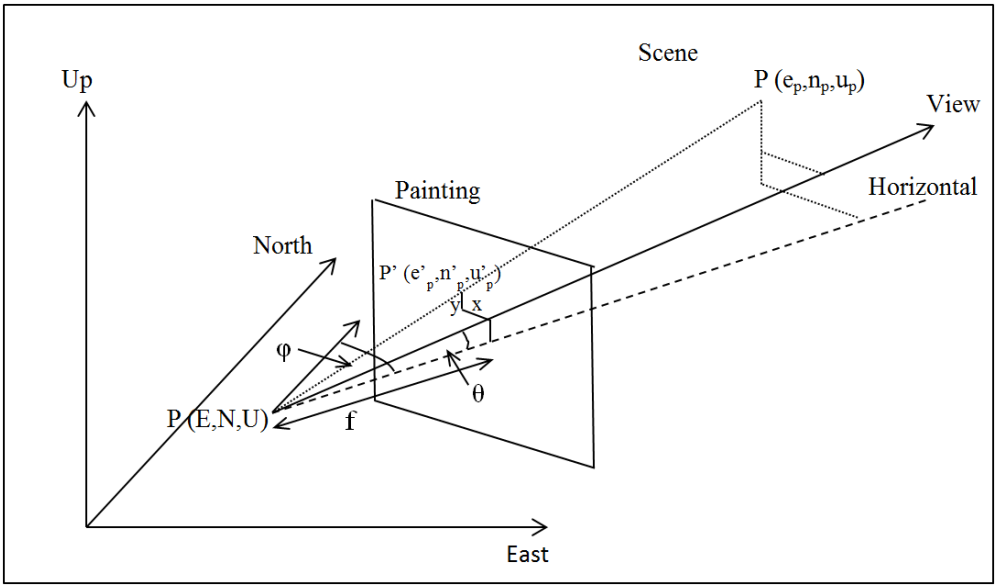

Figure 2.1: Geometry of relationship between artist, picture and the scene.

Analysis of the geometry involves determination of the location of the artist and orientation of the scene relative to this point. By necessity, the focal length (f) must also be determined. Coordinates of a number of points P in the scene are available from maps, and offsets from the centre of the painting for each point P' are measured as x and y from the centre of the painting. The solution for E, N, U, θ, φ and two values for f (vertical and horizontal) requires a minimum of four points. However, use of additional points allows discrepancy between results to be examined as a measure of artistic spatial distortion.

The solution for the variables is divided into two parts; a) by considering the horizontal plane (Figure 2.2), the east and north coordinates of points in the scene together with their horizontal locations (x) in the painting are utilised to find horizontal location (E, N) for the artist together with direction of view from north (φ) and a value for the focal length in the horizontal (f). This two stage approach is

adopted to overcome geometrical problems encountered by Fairburn (2009b) who attempted to use photogrammetric software designed for use with photographs. It is possible that artists used different focal lengths in the horizontal and vertical components, now these values are computed independently.

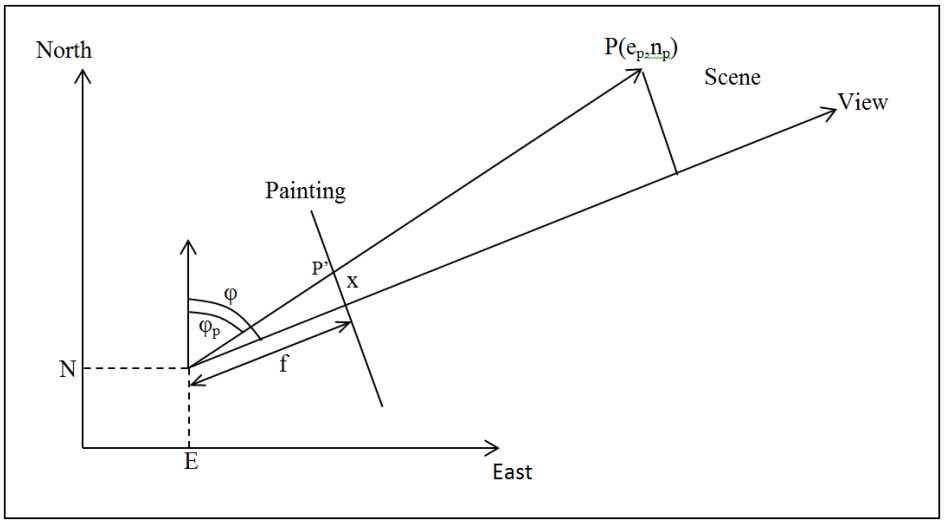

Figure 2.2: Plan view of painting geometry.

Equation 1 is written in the form of an observation equation (Cross 1983) where e_i and n_i are the coordinates of a point i in the scene and x_i is the representative location within the painting. For k points located in both the real world and in the painting there will be k non-linear simultaneous equations with the four unknown parameters defined above. The solution is obtained through linearization and iteration. With more data being incorporated than the minimum four values required, there is no absolute solution, and the final result is optimised using a least squares approach (Cross 1983) that minimises the sum of residual squares. A residual refers to the difference between an observed value (x measured from the painting) and the corresponding computed value for x. Due to redundancy in the number of points

used, any distortion of reality within the painting will mean that a consistent solution cannot be achieved for all points simultaneously, hence computed values for x will differ from those observed from measurements made from the painting. Residuals are the discrepancies between observed values and those computed using the best estimate for the solution. Hence, the final residuals are used in calculating the distortion of reality within the painting.

$$x_i = f_x \frac{\left(\frac{e_i - E}{n_i - N}\right) - \tan\varphi}{1 + \left(\frac{e_i - E}{n_i - N}\right)\tan\varphi} \quad \textbf{(1)}$$

And b), where the vertical plane was considered as shown in Figure 2.3. The remaining three parameters θ, f_y and U representing the elevation of view from the horizontal, focal length in the vertical and altitude of the observer above sea level were calculated by applying equation 2.

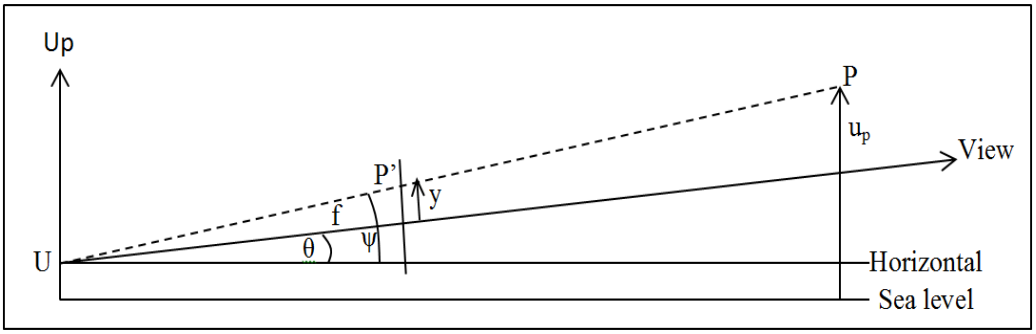

Figure 2.3: Elevation view of painting geometry.

Once more utilising the least squares method with observations y_i measured within the painting and corresponding elevation of the feature in the real world u_p obtained from a map.

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$$y_i = f_y \frac{u_i - U - d_i \tan\theta}{d_i + (u_i - U)\tan\theta} \quad \textbf{(2)}$$

For each of the selected features, an equation in both of these forms (1) and (2) was written. Choosing more points than the minimum required for solving the unknown parameters would produce redundancy in the data. From this procedure the residuals provide a quantitative evaluation of consistency between the scene in the real world and in the painting. The process is illustrated in Figure 2.4 with inputs obtained from the real world and from the painting. Results presented as geometrical parameters and residuals, together indicate consistency in the artistic representation of the scene through redundancy in measures.

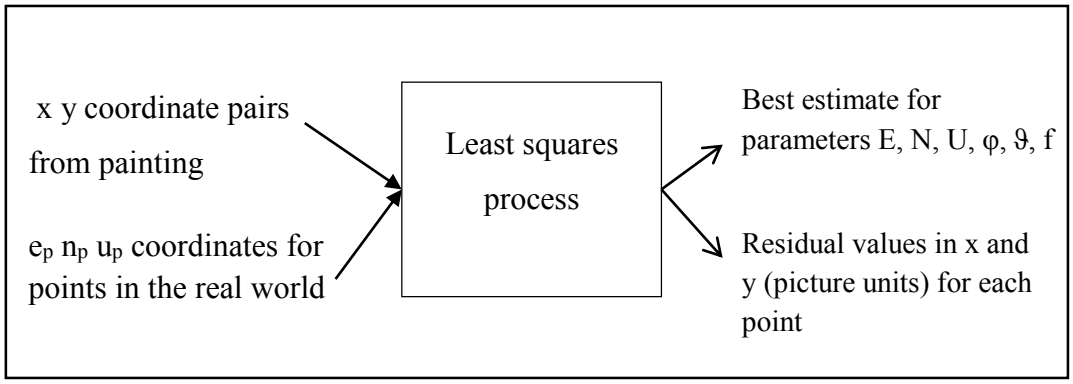

Figure 2.4: Model of least squares process.

Inspection of the sensitivity of the method to selection of points was tested using a painting of Hobart across the River Derwent by Gritten (Figure 2.5). Each of the 12 geo-reference points was removed in turn from the data set and the remaining 11

points used to recalculate the parameters. The influence of the distribution of points around the painting was assessed by removing pairs of points from the analysis.

The selected points in Gritten's painting shown in Figure 2.5, were positioned such that an adjacent pair would provide geometrical strength to the solution for coordinates in a similar direction within the painting, so adjacent pairs were discarded in sequence. Points located on opposite regions of the painting mirrored across the centre might be expected to balance the solution for parameters offering complementary residual values, so these were also discarded as a pair from the solution to investigate the sensitivity.

Figure 2.5: "*View of Hobart Town from across the Derwent*" by Gritten, 1856.

2.4 Results

The four paintings differed markedly in their geometric attributes (Table 2.1). The 1827 painting of Hobart by Frankland (Figure 2.6) from the Dock (Figure 2.7) offers residual values to show that relative locations of selected features are portrayed consistently to within 4 mm within the picture space (Table 2.1). A longer focal distance in the vertical component indicates that the artist used a smaller vertical than horizontal scale, resulting in some degree of vertical exaggeration. The unit variance is the average value of the squared residuals and therefore indicates consistency between all selected features within the paintings. However, values are dimensionless and the magnitude of each should be considered comparatively rather than absolutely. A larger value would indicate a greater use of artistic license in spatial arrangement of features.

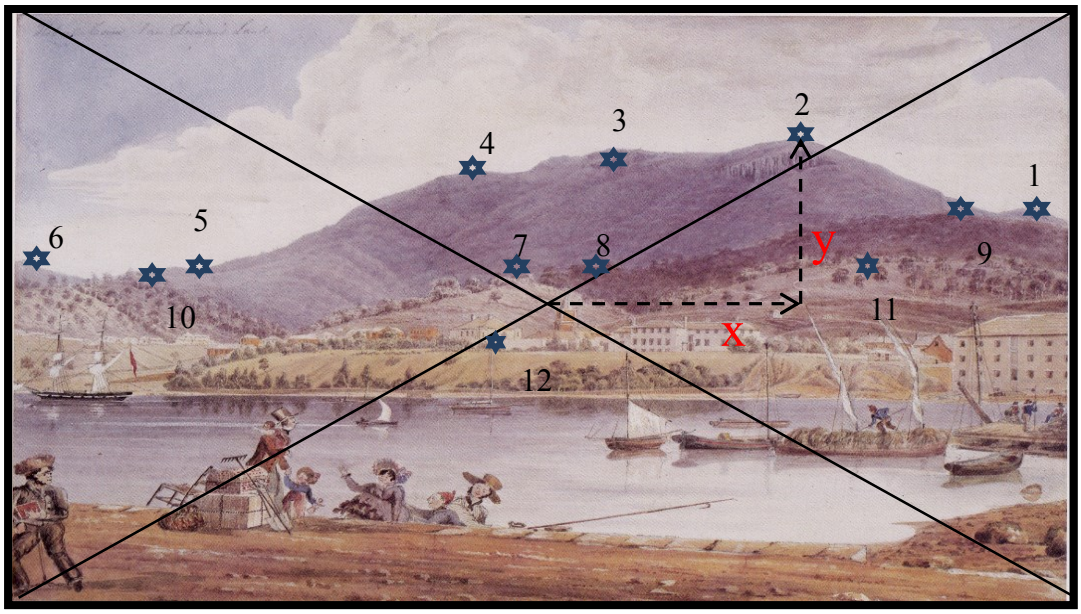

Figure 2.6: "*Hobarton*" by Frankland, watercolour (1827).

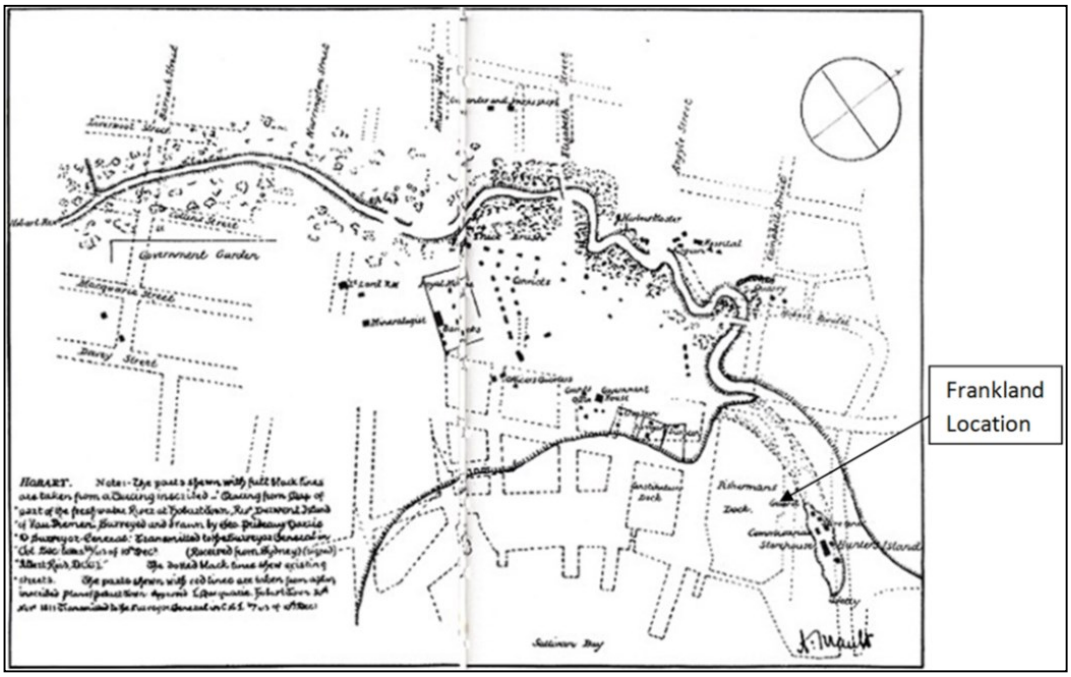

Figure 2.7: Plan for the development of Hobart from 1811, showing the location of artist at Frankland Dock.

The painting by Glover (Figure 2.8) presented some difficulties. It is known that the artist painted from Kangaroo Point across the River Derwent from Hobart. When using Google Earth to identify features for coordination of the painting, it was instantly apparent that the landscape to the north of Mount Wellington, at the right on the painting, does not represent the real topography of the area. The artist has changed the landscape, perhaps deliberately to give the work symmetry about the central mountain. Utilising features that can be identified in the region of Mount Wellington to the south and in the foreground, places the artist in the Derwent Estuary near Kangaroo Point, about 250 m closer to Hobart than the location estimated visually and in the direction of orientation of the painting. This suggests that the background was brought forward, or was painted from one point while the foreground was added from another location 250 m further back. Integrity of the

landscape has been retained in the vertical component as residuals are less, but the scale is different in the horizontal and vertical components as indicated by a doubling of the focal length.

The view looking down at Hobart by Strange (Figure 2.9) was painted from the western side of the Derwent Estuary. A geometrical analysis of features in the painting places the artist 400 m horizontally from the summit of Knocklofty (Table 2.1) where the elevation given on maps is 320 m. In reality, the city of Hobart cannot be seen from the summit of Knocklofty. However, the elevation of 376 m is similar to the height of the hill, which is 371 m. It is as if the artist elevated himself by scaling the background scene proportionally.

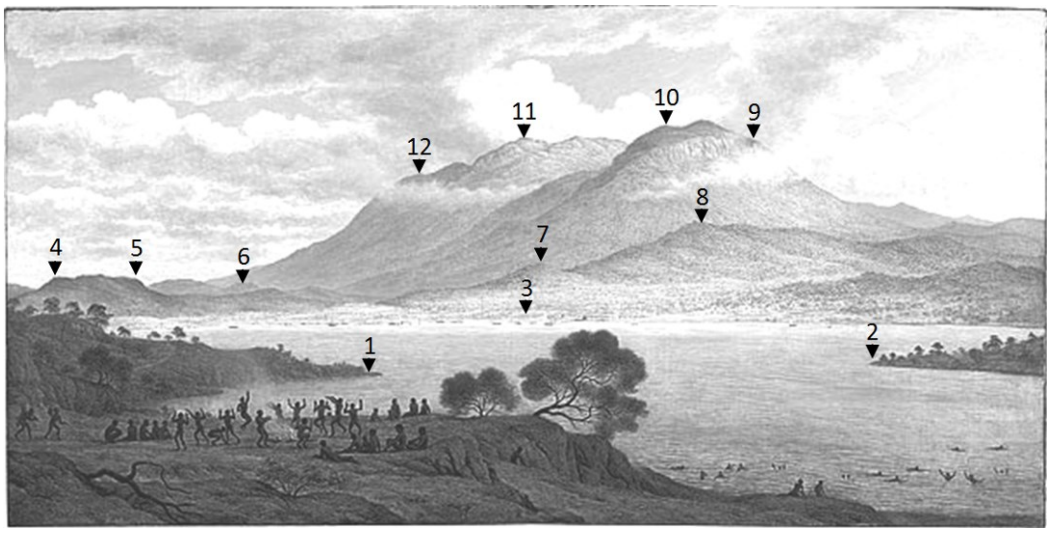

Figure 2.8: "*Hobart from Kangaroo Point*", by John Glover (1834).

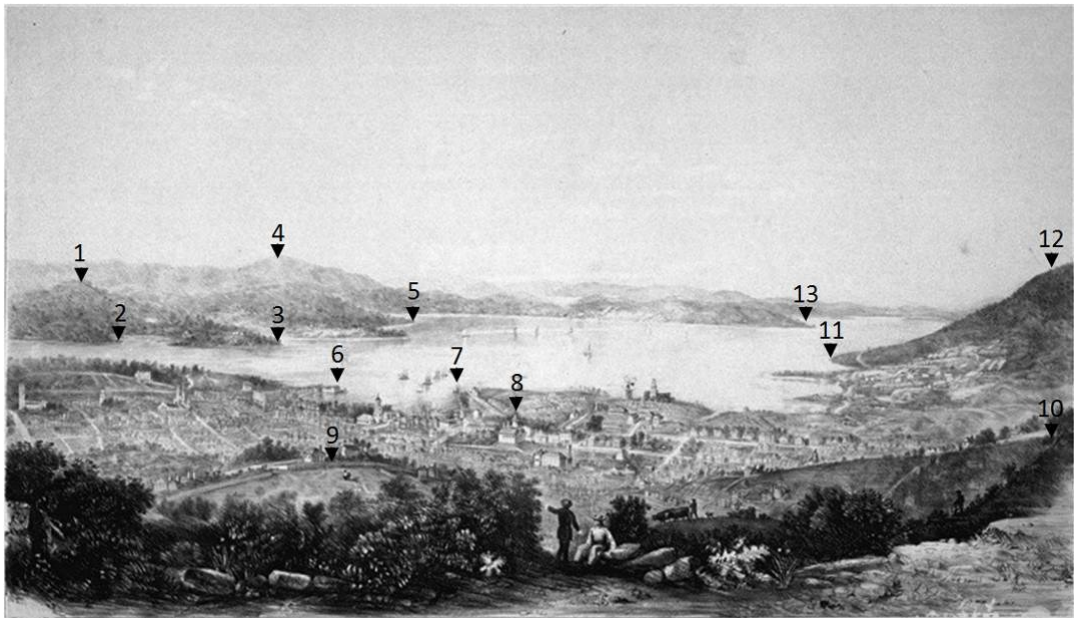

Figure 2.9: "*Hobarton*", a lithograph by Hood RV (1802-88) of a painting by Frederick Strange dated 1854. (original not available)

Table 2.1: Geometrical properties of selected paintings by four artists.

Artist	Year	Artist Location (m AGD94)			Direction of view	Elevation of view	Focal length (m)		Max. Residual (mm)		Unit Var.
		East	North	Altitude			Horiz.	Vert.	Horiz.	Vert.	
Frankland	1827	527322	5252326	2.8	248˚	3.4˚	0.63	0.93	3	4	4.4
Glover	1834	529633	5252905	3.1	246˚	2.2˚	1.69	3.04	20	6	17.2
Gritten	1856	529369	5252106	173	250˚	2.0˚	1.34	1.49	18	6	5.7
Strange	1854	524442	5251855	376	101˚	-1.3˚	0.44	0.25	15	8	3.4

Calculations suggest that Gritten (Figure 2.5) painted about 0.5 km off Kangaroo Point at a point 173 m above the river. The view of elevation to the centreline of the painting is slightly upwards. In this case, the ratio between the focus in the vertical and horizontal components is much closer to 1 than in the other works studied herein. In addition, with the exception of one point in the painting that is 18 mm out of position, the residuals are less than 10 mm, indicating that the painting is an accurate representation of the scene. Of the four paintings, that by Gritten offers the most detailed portrayal of a scene. Point number 8 (Figure 2.5) has the largest residual value of 18 mm. That is, relative to all points taken this feature is displaced from its true location by 18 mm in the picture space. It should be noted that the number of geo-reference points identified on each image is arbitrary. Ideally, features will be identified from across the entire scene. In the painting by Gritten (Figure 2.5) points used for georeferencing were removed in turn to determine influence on the parameters associated with artist location and direction. The greatest deviation from reality is in the east-west direction (Table 2.2). The greatest change in parameters as a whole is obtained by removing point 7. There is no logical geometrical explanation for this result. In the initial analysis using all of the points the largest residual in the horizontal component of 18 mm was obtained for point 8. When this point was removed the calculated location of the artist was 60 m further east and 26 m higher, at an elevation of 199 m. This location places the artist directly over Kangaroo Point where a balloon may have been tethered. Budd (2009) point out that ballooning was a popular pastime of the era. Unlike Strange who was at an elevation and may have scaled the image to increase height, Gritten could not have done this from Kangaroo Point. From a lower elevation the artist would not have seen the detail portrayed on the opposite bank of the River Derwent.

When adjacent points are removed from the Gritten painting (Figure 2.5) there is a change of up to 800 m in the horizontal location of the artist (Table 2.3). Removal of points 1 and 2 eliminates features in the lower right quadrant, and the use of the remaining points changes the point of view. Points 7 and 8 are critical to the determination of the vertical location of the artist as these are located closest to vertically from the viewpoint. The removal of opposing points also had some impact, with 4 and 9 being critical in controlling the lower left to upper right diagonal and 6 and 7 lying in the vertical line of view of the artist.

Table 2.2: Change in geometrical properties on removal of one point from analysis applied to painting by Gritten dated 1856.

Point Removed	**Change in artist location (m)**			**Change in Direction**	**Change in elevation**	**Change in focus (m)**	
	East	**North**	**Altitude**			**Horizon**	**Vertical**
1	72	26	10	0˚	-0.2˚	0.02	-0.01
2	41	-7	55	-1˚	-0.5˚	0.02	-0.19
3	37	8	10	-1˚	-0.2˚	0.03	-0.02
4	93	32	11	-2˚	-0.2˚	0.06	0.00
5	-25	-13	-15	0˚	0.0˚	-0.02	0.08
6	2	2	-13	0˚	-0.1˚	0.00	0.08
7	-84	5	-83	0˚	0.9˚	-0.04	0.23
8	-60	0	-26	0˚	0.3˚	-0.02	0.08
9	90	-1	-25	-2˚	0.1˚	0.01	0.04
10	-15	-3	3	0˚	-0.1˚	-0.01	-0.03
11	-51	0	2	0˚	0.0˚	-0.03	-0.06
12	55	-8	34	-1˚	-0.3˚	0.02	-0.17

Table 2.3: Result of removal of two points, there is a change in the geometrical properties from analysis applied to painting by Gritten, 1856.

Points Removed	Change in artist location (m)			Change in Direction	Change in elevation	Change in focus (m)	
	East	North	Altitude			Horizon	Vertical
1 and 2	-710	-334	42	2˚	-0.2˚	-0.14	-0.29
3 and 4	204	63	27	-4˚	-0.4˚	0.13	-0.02
5 and 6	-26	-14	-37	0˚	-0.1˚	-0.02	0.21
7 and 8	-136	5	-280	0˚	3.0˚	-0.06	0.59
9 and 10	184	-27	-4	-2˚	-0.1˚	-0.02	0.00
11 and 12	40	-9	48	0˚	-0.3˚	0.02	-0.32
1 and 12	91	5	36	0	-0.3	0.03	-0.17
2 and 11	-4	-10	58	0	-0.4	0.00	-0.26
3 and 10	30	8	16	-1	-0.3	0.01	-0.06
4 and 9	177	37	-15	-5	0.0	0.07	0.04
5 and 8	-96	-18	-44	1	0.3	-0.05	0.15
6 and 7	-82	9	-102	0	0.9	-0.04	0.31

2.5 Discussion

Application of of the least squares technique allows the location of the artist to be determined from features within the painting. Personal visits to the locations to estimate the point of view suggested that, in the cases of Strange and Glover, the

results lie within 300 m of the artist's location, while for Frankland they are within tens of metres.

In comparison with known altitudes at artist locations, the view altitudes are within about 50 m for Strange, 30 m for Glover, and a few metres for Frankland. For Gritten there is a discrepancy of almost 200 m between altitude of the terrain and that computed for the artist from geometric analysis of the painting, but the result for the location places the artist on land at the tip of Kangaroo point and as such is sensible. Although it is possible that the altitude was contrived, the accuracy of the depiction suggests that it is more likely that a balloon and camera were employed. Further properties of paintings are identified in the elevation. In the cases of Frankland, Glover, and Gritten, the centreline of the painting is directed upwards from the horizontal. The focus is smaller in the horizontal plane than it is in the vertical, thereby reducing the scale in the horizontal component in comparison with the vertical. The ratios of horizontal to vertical focal lengths are 0.67 and 0.56, respectively. When looking down onto the town of Hobart, Strange reversed these comparative scales to give a ratio of 1.42, which is 1/0.7, and Gritten used similar scales in both components. The magnitude of the residuals reflects artistic distortion of reality, and those for the formally-trained artist, Glover, are the greatest. Some of the topographic features in his painting are completely misrepresented to provide better composition, utilising the artistic license (Nordstrom and Jackson 2001). Strange, a convict turned to portrait painter, provided a relatively accurate portrayal of the scene. Works by Frankland and Gritten are the most accurate depictions of the views that were painted. In the case of Frankland this might be expected given his training as a surveyor with specialist skills in plotting spatial data. Gritten was a professional photographer and it is possible that he painted from a photograph.

In georeferencing an image it is important that control is available across the landscape. The removal of control has demonstrated the biases that can exist in geometrical parameters derived for the artwork as a consequence of control point selection. The artist has portrayed a scene and without use of tools to project the real image onto the canvas there will always be imperfections. Use of least squares in georeferencing amalgamates distortions across the portrayal of the scene thereby giving a measure of distortion as a whole. Selectivity of regions for control do not offer a geometrical perspective of the whole.

2.6 Conclusions

Initial inspection of persistent topographic features and known locations of historical structures shown in landscape paintings can determine the perspective adopted by the artist and the degree of accuracy of their representations of reality. While this is useful in itself, enabling the location from which the painting was made to be pinpointed, it also provides the opportunity to gather further spatial information. Such information can be useful for determination of changes in the landscape (Fairbairn 2009a). The residuals from the features used to reference the paintings and difference between horizontal and vertical scales indicate the degree of artistic license. Such defection to the arrangement and shape of features may indicate the nature of the aesthetic principles adopted by the painter (Dewey 1934; Schroeder 1993; Adorno 1997; Orr 2005). Dewey (1934) claimed that artist maintain relation that bind parts into a whole, however, the variation in accuracy suggests that the use of paintings for historical reconstructions and measurements of historic features, should be preceded by an accuracy assessment.

Testimony

Material in this chapter was published as Farag-Miller, M, Miller, K. and Kirkpatrick, JB., 2013. Determining the accuracy of historical landscape paintings. *Geographical Research* 51, 49-58.

Farag-Miller contributed most of the analytical ideas and 70% of the writing

Miller helped develop the photogrammetric technique and contributed 10% of the writing

Kirkpatrick helped conceive the project and contributed 20% of the writing/

Signed:

Chapter 3. Social status as a factor in the depiction of landscape

3.1 Introduction

Any artistic landscape depiction requires the selection of a scene. A scene is usually composed of features that enhance the aesthetic appeal of the pictures (Dewey 1934; Gilpin 1792, p. 42; Fairbairn 2009b). While aesthetics are culturally influenced (Berleant 1991, p. 20), there are common features such as mountains, trees, water bodies, grassy fields and traditional and elegant buildings (Andrews 1989; Howard 1991; Daniels and Cosgrove, 1988). The sky is portrayed in almost in every landscape picture (Gersh-Nesic 2015).

Natural features were present in abundance around the developing region of Hobart in the 19th century and artists were keen to illustrate development within the new settlement. Howkins (1997), holds that works of landscape art present a personal interpretation of reality, in that style and content reflect the personal predilections of the individual artist (Dewey 1934; Adams and Robins 2000; Lettner and Sablatnig 2008). These differences in preferences for style and scene may, in turn, reflect the social background and profession of the artist. Given the diverse features available for portrayal in 19th century landscape art, one would expect considerable variation between individuals in their preferences for different features and in the ways in which they portrayed them.

In Hobart, the creators of artworks in the 19th century came from a variety of backgrounds. Many were professional artists, while others were government officers or convicts (Hansen 2003). In a wider context, Gough (2009) suggests government officers, such as the surveyors and the military officers, accurately depicted the

topography in their drawings and paintings, sacrificing the picturesque for realism (Klonk 1997). In contrast, professional artists are thought to have selected views suitable for potential buyers of artwork, or scenes chosen by a patron (Cosgrove 1985; Daniels et al 1997; Jordan 2002). In most cases artists would have made adjustments to reality to meet aesthetic criteria. Prior to extraction geospatial data from the collective artworks it is thus important to evaluate the response of artists from different backgrounds to a diverse landscape with scenery that changed through time as the new settlement expanded.

Male artists from diverse strata of society artistically portrayed the landscape, whereas only females from a particular class depicted the landscape (Sloan 1997, Masten 2008; Jordan 2002). Only upper and middle class girls would receive training in drawing and painting in watercolour, which some continued to practice in adult life. However, those who migrated to Tasmania might have been expected to bring the artistic styles and techniques from their home.

Gillian (1993, p. 88) draws on descriptions made by settlers of North America that identify the land as feminine. The relationship between men and land was different to a female perspective as it was the men who set out to explore the wilderness. Others propose that in art work men represent landscape differently from women (Burke 1975; Chodorow 2001; Dinnerstine, 1976). Monk (1984) suggests that men viewed the landscape as a barren desert, while women painted lush green vegetation. However, Bronwyn (2003) maintains that gender is unlikely to have influenced perception.

Social class determines the place and the activities of the individuals within society (Hewett 2004, p. 313). With art being a commodity for the wealthy, the question therefore arises whether gender or social status of the artist affects the selection of

scenes and the manner in which they were portrayed. As a developing community with a range of immigrants from diverse backgrounds, the location of Hobart is ideally suited to such a study through the first century of settlement. The present chapter first describes variation in individual standing within society, professional position and origin of most prolific artists of the 57, then outlines the choice of scene and style of painting in relation to their background.

The history of the individuals and the artwork they produced of Tasmania is well-documented (e.g. Rex 1967; Robson 1983; Kolenberg 1987; Hansen 2003; Alexander 2006), yet, the influence of the background and gender of the artists on style, choice of subject and medium has not previously been thoroughly investigated.

3.2 Hobart in the 19th Century

The establishment of Hobart and the occupation of Tasmania required people with a wide range of skills. Labourers and some skilled tradesmen, of convicts, were sent by force, though, this source of labour ceased when transportation of prisoners was abolished in 1853 (Duffield 1986; Macintyre 1999, p 77). From 1820 the population increased with the arrival of free settlers. The population grew from 3,240 in 1808, to 40,172 in 1835 (still mostly convicts) to 99,328 in 1870.

Migration was selective, with members of the middle and upper middle classes being permitted to immigrate under strictly controlled conditions (Evans 1822). However, land regulations that were introduced in 1822 attracted people with capital to invest in land for agriculture. Various migration schemes were adopted during the next four decades, and people arrived under these schemes at the rate of a few hundred each year (Pearce and Cowling 1975). In 1840 as transportation of convicts to New South Wales was stopped consequently the number of convicts sent to

Tasmania increased (Macintyre 1999, p. 76). The diversity of the population further increased as Hobart gained strategic importance in supplying and servicing vessels employed in whaling and sealing activities (Bertram et al 2007, p. 137).

3.3 Rationale for Variables

The strategy adopted here involves identifying variables associated with the artists and grouping the individuals in an effort to quantify characteristics of their work in relation to the location, medium, gender, social background and status in society.

The popularity of spatial locations used by artists may be governed by factors beyond the aesthetics of the available scenes. Ease of access to a particular place may be related to the social status of the individual. For instance, landowners may have been more privileged in their free-time to visit some of the more appealing popular locations. The study area encompasses the area around Hobart (Figure 3.1). Artists were classed into three social background for mapping. On visual inspection of the spatial distribution of artwork they fell into the 16 geographical areas shown.

During the century the medium used by artists vary with some utilizing graphite or charcoal and others preferring water colour or oil painting. Some media such as oil paint were more costly than others, it is therefore expected that only wealthy artist would have produced work in oil. Hence, medium is a significant variable in the assessment of artwork.

Men and women were treated differently in the patriarchal society that was 19th century England, with unequal privileges to access various spaces that make up landscape art (Adams and Robins 2000, p. 2). Women were thought to lack the ability to paint the landscape (Gracyk 2012; Whyte 2002; Perry and Rossington 1994), and many female artists avoided the subject. All female artists in Hobart came

from middle class families, and were financially dependent on their husbands or fathers. In early colonial Tasmania female artist had more freedom than those in England, becoming professional artists and earning income (Robertson 1970). Therefore, examination of work produced by seven female artists who lived in Tasmania during the first century of development is relevant to the assessment of the female role in that society. Furthermore, gender and the medium were closely related (Hermreich 2000, p.46), with some media considered to be more suitable for woman than other media. From this perspective, analysis of the number of works produced by females and male artists, compared to the medium used, might support or refute such ideology.

Social background of an individual artist may have influenced scenes they depicted. Artists are classified into government officials, convicts and professional artists. Government officials include administrative staff, military persons, surveyors, and art teachers, who were typically sent or migrated to Tasmania to fulfil a particular role within the developing society.

Convicts were a valuable source of free and cheap labour for the development of the colony (Ross 1832; Morgan 2012, p. 15; Boyce 2008, p. 52). The class of convicts in the present study included those who were originally transported as prisoners but later became free members of society. In most cases a convict with talent was apprenticed to a businessman or government official who, most likely, provided art materials and gained the profit from selling the work. At the end of the period, individuals gained their freedom and eventually worked for themselves.

Professional artists included immigrants and travellers who had some prior artistic background. Their move to Tasmania might not have been primarily with the

intention to portray the surroundings, and their primary income may not have been from painting.

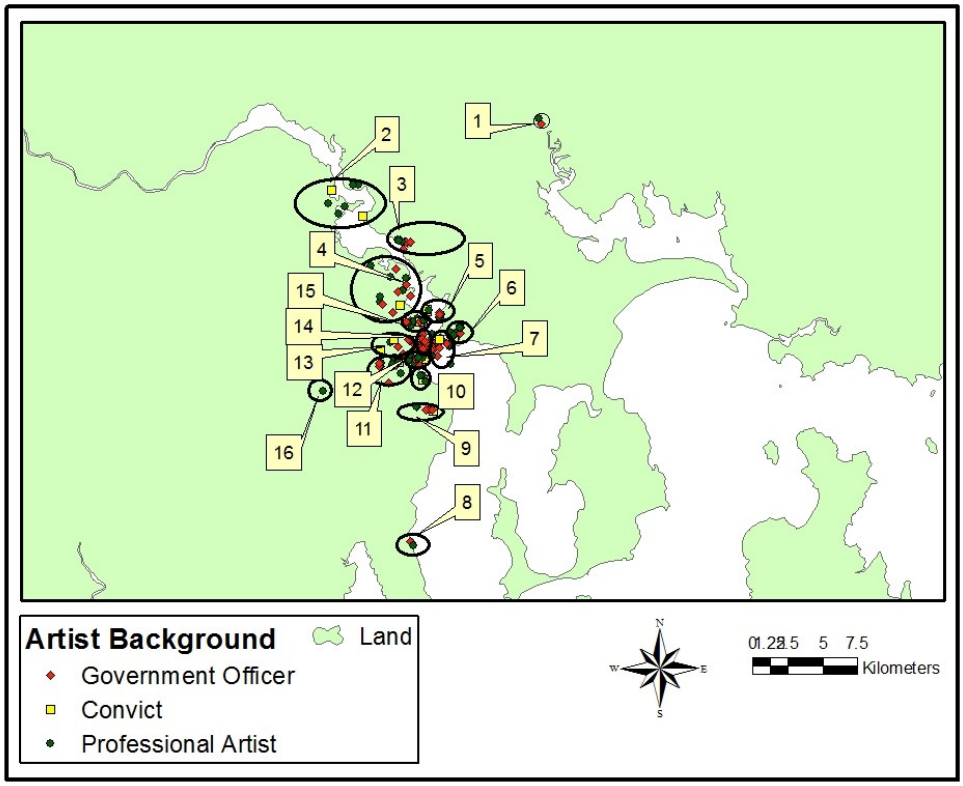

Figure 3.1: The study area and the places from which scenes were depicted by artists in the 19th century: 1. Richmond, 2. Roseneath, 3. Old Beach, 4. New Town, 5. Risdon, 6. Kangaroo Bay, 7. The Derwent, 8. Blackmans Bay, 9. Mount Nelson, 10. Sandy Bay, 11. South Hobart, 12 Battery Point, 13.North Hobart, 14.Wharf, 15.Domain; 16.Springs.

3.4The Artists

"Not all colonial artists could afford the luxury of full time practice" (Aitkin 2011, p. 73), and in Tasmania the situation was probably no different. The present study examines artists as individuals who used their skills for economic gain. Most of them depicted the surrounding environment including natural and human-made elements. The selected artists exemplified the social structure and culture of the time. Prior to

the presentation of statistics generated from a sample of artworks, these are initially placed in context by reviewing some of the characters involved, the style that they adopted and the medium utilised.

3.4.1 Immigrant artists

Artists with formal training travelled to Tasmania from Europe as free settlers. Both Glover and Mary Morton Allport (1806-1895) were people of some wealth who migrated with the intention of farming. While neither of them was successful in this regard, they gained a reputation as artists within the settlement (Hansen 2003).

Art is an accomplishment enjoyed by people of position or means. Glover distorted the reality of the landscape (Farag-Miller, Miller & Kirkpatrick 2013) painting in the popular style of the time, the picturesque. Hansen (2003) discusses his portrayal of Aborigines in one painting "*Last muster of Tasmanian aborigine at Risdon*", as a group happily dancing and swimming by the edge of the River Derwent, giving the illusion of a harmony and contentment, while in reality, there was conflicts with the European settlers from the date of settlement to 1830, when the few remaining Aborigines were deported to Flinders Island (Paull, 2011, p. 158). Glover is unlikely to have seen Aborigines in a free state. In another painting by Glover "*Hobart Town from the artist home*" (1831), he shows a house temporarily occupied as his home. The house is of typical English dressed stone construction with an English garden decorated with geraniums and roses (Hansen 2003). Hobart in the background appears idyllic, the artist looking down at cluster of well-spaced colourful houses on wide well-organised streets. In reality according to Darwin (cited in Nicholas and Nicholas 2008, p. 124) "*the growth of small houses is most abundant; the vast number of little red brick houses, scattered on the hill, behind the town, sadly destroy its picturesque effect*". As the settlement developed, former convict

Frederick Strange (1807-1874) depicted the city from above in *"Hobarton from Knocklofty*" (1853), showing a less attractive layout than that depicted by the free artists, consisting of strips of unoccupied land around the outside of more densely packed blocks of irregular buildings, indicating that within twenty years the place had become crowded.

3.4.2 The Travellers

Men with talent travelled around the world depicting their surroundings. Among this group was Augustus Earle (1793-1838), a son of American artists James Earl (1761-96). Augustus Earle made panoramic views of topography of the town and its surrounds (Smith 1960; Sayers 2001). Earle was a trained artist who travelled around the world visiting places and recording various scenes in Europe, Mediterranean shores, North America, and South America (Keynes 1979). When he failed to establish a career in Australia he returned to England where his painting from Battery Point entitled 'Panorama of Hobart Town, 1825' in watercolour, was exhibited in London in 1829. Earle tended to promote the beauty of the town as part of the expanding British Empire, depicting a lively atmosphere, soothing sky, rising hills, green valleys, water adorned with vessels and mountains crowning the city (Sayers 2001, p. 34). This scene by Earle was not necessarily representative of reality as Charles Darwin expressed in his diary his disappointment in Hobart in 1836 "*In London, I saw a Panorama of Hobart town; the scenery was very magnificent, but unfortunately there is no resemblance to it in nature*" (Nicholas and Nicholas 2008, p. 96).

Immigrant artists played an important role in the promotion of Tasmania as a location for immigration. Portrayal of the surroundings was often idyllic to the extent that features were adjusted to offer aesthetic appeal. In some instances the landscape

that was painted was more akin to their homeland than Tasmania. Purpose, training and experience may have led to a different selection of scenes and features than those offered by other professions.

3.4.3 Government Officials

Among the early settlers to the island were Government officials, including surveyors who set out to survey the land together with draughtsmen who produced plans and maps, soldiers and administrators (Ross 1832). Surveyors, such as Evans and Frankland, were prominent figures in their depiction of Tasmania landscape, as were the soldiers, such as James William Mansfield (1824-1870) and Simpkinson de Wesselow (1819-1906). Both surveyors and the military utilise spatial data and therefore often have a capability to depict terrain associated with their profession.

Frankland, a government official was involved in mapping the island and recording his observations of the natural history of sites around Tasmania (Eldershaw 1966). In 1827 he showed characters at the waterfront, perhaps new arrivals to the colony (Alan 1989). An apparently happy group of women, with fancy dresses and hats, are positioned with their luggage in an area where land is being reclaimed. The government house located at the heart of the scene and the cathedral nearby signify the advent of law and order in a new colony founded on convict labour. Life is portrayed as idyllic, and the landscape in the background naturally attractive. Frankland is setting a scene other than that presented in official government documents, perhaps to attract free immigrants (Evans 1822; Melville 1833), particularly people of wealth (Boyce 2008, p. 140). In reality, there was discomfort within the new settlement. A lack of tools led to difficulty in clearance of land for agriculture and the inability to build proper houses; consequently, many settlers were

forced to live in tents or huts. There were difficulties in the transportation of produce from the land to the settlement and complaints of poor quality of service provided by the convict labour force, which was mainly unskilled (Atkinson 2005). The Tasmanian tiger caused threats to livestock and many of the settlers who were granted land were unfamiliar with farming (Alexander 2009). At this time there were widespread conflicts between the settlers and the Aborigines (Dixon 1839, p 24-26; Macintyre 2009, p. 61; Morgan 1992, p. 149). Bushrangers, the runaway convicts, were also causing security threats to goods and the life of free settlers (Goodridge 1832; Boyce 2008, p. 166; Atkinson 2005).

Among the first people to arrive in Hobart were the military. Their studies of the landforms and the town contributed significantly to the historical record. Some recorded the geography of the undeveloped landscape of the new colony (Hansen 2012). Others who were specifically trained, produced sketches of topography that were accurate enough to enable the tactical location of defence installations (Gough 2009). While their drawings are likely to be accurate representations of landscape, the perspective of objects often varied by importance, not distance.

Important features can be unrealistically prominent. For example, the drawing by Charles Atkinson (1806-37) entitled *The Seat of His Excellency Lieutenant Gov. Arthur* (1837), the government buildings, including the Barracks, are vertically exaggerated relative to the boats that are closer to the viewer, unlike the realistic scene of the same buildings, depicted by Augustus Earle (1793-1838) in *Panorama of Hobart* (1825).

Art teachers moving to Hobart produced work depicting various scenes. Dominant figures are Thomas Evans Chapman (1789-1864) and John Skinner Prout (1805-76). In 1834 Chapman arrived from England using his skills as an artist to supplement

earnings as an art teacher in government employment. He is renowned for his detailed portrayal of historic places such as St. David's Cathedral (St. David's church at the time of depiction), the Government House, located at Pavilion Point where the first regatta was held and the Commissariat Store, the depot for the island's supplies.

In the 1860s popular work was accomplished by William Charles Piguenit (1836-1914). He was the first male artist born in Tasmanian, a son of ex-convict father. At the age of fourteen Piguenit started to work as a draughtsman in the Survey Office where under guidance from his colleague and artist, Frank Dunnet (1822-91), he received training in painting. Piguenit produced works in oil, watercolour and lithographs, his work exhibited at the local art galleries as well as international art galleries; in Sydney in 1874, Paris in 1893, Manchester in 1895 and in London in 1898 and 1900 (Backhouse and Johannes 2000).

The government workers may have produced art works as a past-time (Brand 2004), but inspection of the scenes and their portrayal suggests that they viewed their role as significant within the community through highlighting the features associated with government positions. Their depiction of scenes varied in style, but their training was likely to have influenced depiction of elements in their work. While surveyors and military officers placed the emphasis on features that serve colonial development, teachers complied with the academic rules of perspective.

3.4.4 Convict

Convicts were the property of the government assigned to free settler, as individuals they could not be sold by their masters. However, masters provided food, clothes and shelter, whilst the convicts provided their services (Hindmarch 2002). Convicts had the right to report to the magistrate if masters failed to provide, at the same time, if

they disobeyed their masters, they would be flogged or send to work in the chains (Backhouse 1843, p. 162). From England the convicts were sent to Tasmania as early as in 1803. They came from different parts of England, its territories and also from different parts of Europe (Ewins 2001). Most of the convicts were transported for committing burglary, robbery, stealing, and forgery (Reid 1822; Atkinson 2005).

Skilled and unskilled individuals were used to build towns, roads, bridges and facilities to accommodate the developing colony. In some instances, the male convicts turned their hand to artistic promotion of the island, and made good in this profession. Convicted for forgery of bank notes, Joseph Lycett (1775-1828) is tought to have no professional training in art. He used his skills in drawing and watercolour to portrait elements of nature. Unlike his contemporary colonial artists in North America who represented wild nature to satisfy local and European market, the depiction of the landscape by Lycett tended to represent the modification accomplished by European settlers to attract migrants (Hoorn 1990; Haynes 2003). Although some claimed that Lycett never set foot on Tasmania, his pictures depicting Hobart and its surroundings among other work that depicted scenes of mainland Australia were exhibited in New South Wales to promote the new places. In 1824 he returned to England as a free professional artist and published a book of his work.

Knut Bull (1811-1889), originally Norwegian, was formally trained in art in Copenhagen. He was transported from England as a forger. In 1855, two years after being given a pardon, two of his landscape paintings of the island were exhibited in Paris. Other drawings of his work were used by others for reproduction as lithographs.

The work of convicts varied in subject, media and portrayal, some lacking an accurate representation of reality. Lycett, for example, focussed on depicting the topography in an appealing formal landscape, such as is evident in his painting of Mount Nelson from near Mulgrave Battery (Figure 3.2), showing hills covered with green vegetation and grasslands beside the river in use for recreation. The view is enjoyed by an Officer and a lady attired in contemporary fashion. There are houses surrounded by cleared lands, gardens, and roads cut through the trees to facilitate better communication; indications of progress that was largely due to convict labour. The artist placed the Navy ship anchored on the harbour to assure viewers of protection and security. At that time, bushrangers and the island's native settlers, the Aborigines, were a considerable threat to the settlers, regularly attacking and stealing food (Cash 1929; Rowcraft 1855; Morgan 1992, p. 128-132; Macintyre 1999, p 76; Atkinson 2005). However, such works can also be seen as fanciful, particularly in terms of the vegetation cover. Eucalypts trees are mutated into something similar to English Oak (Lien and Melhuus 2007). An example is shown in Figure 3.2. While the scene itself is easily recognisable as Sandy Bay in Tasmania with Mount Nelson in the background, the details of tree form across the painting reflect the English countryside.

Figure 3.2: "Mount Nelson, near Hobart Town from near Mulgrave battery, Van Diemen's Land", by Lycett, 1824.

Other convicts showed more consideration for their new society and surroundings. For example Thomas Bock (1790-1855) painted a view from the Queen's Domain in oil paint. The scene entitled is Rossbank Observatory, looking northeast with trees stumps in foreground and three Government Officials at the centre, including Governor John Franklin (1786-1847), with the Tasmanian hills as a background. Bock focussed on recording one of the important achievements on the island, an astronomic and magnetic observation point that facilitated navigation and exploration activities in the high latitudes. Tree stumps were indication of control over the landscape, as well as of degradation of the environment (Lappé and Lappé 2013, p. 971). Inspection of the artworks of convicts suggests variation in views and style.

3.4.5 Tasmania Born Artists

The second half of the century was marked by emerging of local born artists. They are a few in numbers but made significant contribution to the depiction of the achievement of the island. Some were born to free settlers families such as Emily

Stuart Bowring (1835-1912). Bowring produced scenes of the River Derwent and amongst her other depictions is Government House, a landmark amongst the society of the period. Bowring was born into a family involved in the art of drawing and sketching. Much of her work displays cultural landscape with grazing sheep, and horses, fenced plots of land and crops. In 1887, Bowring's watercolour painting *View of Corra Linn* was exhibited and praised by local paper *The Mercury*[5]. Piguenit the government employee discussed in Section 3.4.3, became an established artist living within the society of Tasmania. He is regarded as the first Australian-born landscape artist (Trigger 2003, p. 13).

3.5 Gender

According to the World Health Organization, gender is socially constructed roles behaviours, activities and attributes that a given society considers appropriate for men and women[6]. Gender, being male or female, a concept commonly used by many investigators of nineteenth century artists of Europe (e.g., Rose 1993; Orr 1995; Malcolm 1999). Rose (1993) pointed out the systematic and symbolic use of gender for representation of differences. The male was framed as energetic, independent and rational in contrast to the female, who was supposedly passive, dependent, weak, and emotional (Scott and Tilly 1975). John Barrel pointed out that in English tradition female artists were, "*credited with an aptitude for sensitive miniaturist portraits of cottages, village scenes, flowers, but were held to lack the intellectual virility to be able to organize a spacious, multifarious landscape."*(cited in Malcolm 1999, p. 157). Therefore, women of the middle class received training in needlework, music,

[5]1887, Mercury, 02-16.
[6] http://www.who.i'nt/gender/whatisgender/en/.

dancing, drawing and painting in water colour (Norton 2009, p. 1). Poor girls were trained for cleaning and cooking.

The females who migrated with their families to Tasmania came from the middle class in England. Within that group of society, men were considered as the breadwinners, whilst the wife was subordinate to her husband (Scott and Tilly 1975). There were also legal issues. As a married women, they were not independent citizen, not allowed to vote or own properties. Women were required to wear long skirts and tops with tight corsets that strap around the bosom and waist, such complex costume restrict the ability to move freely. Hence, outside the home, a woman must be accompanied by a male.

In Hobart, Mary Morton Allport and Louisa Anne Meredith (1812-95) depicted their environments in their art (Kerr 1992; Sayers 2001). Allport recorded various scenes including the streets, colonial architecture, gardens, people as well as social events. Her work entitled "*Regatta from Sandy Bay*" offers a watercolour painting of Hobart that shows a beautifully blue river with green space and racing yachts. This portrayal is reminiscent of the grand event at Henley that started in 1838. She produced scenes of picturesque landscapes that were exhibited in a fine art exhibition in Hobart. These scenes are clearly intended to portray an environment that was appealing as well as providing a visual record of the event before the introduction of photography to Tasmania in the mid of the century. Meredith produced sketches of the River Derwent and Hobart Town, but unlike Mary, she focused on writing, and sketching the flora and fauna of the island.

Few females gained success as artists. Art as a profession required not only training but also finance to acquire art materials. As the settlement matured, those who were born in Tasmania, such as Margaret Sarah Cleburne (1829-85), created an identity

for the island. Producing work that included natural scenery and structures of historic significance. Cleburne was the first Tasmanian female born artist. She painted the local natural scenes, such as the *River Derwent from Old Beach*.

In the developing community of Hobart, some of the female artists thus broke with European tradition by painting landscape, which was at the time considered to be a masculine theme.

3.6 Medium

The artist executes his or her work, utilizing particular materials/tools (Barrett 2011), based on commodities and feelings. Such materials vary in practicality of use on site like graphite and water colour, whereas, others may require months for complete dryness. Graphite or charcoal tools are practical media utilised by most artists in the depiction of a scene on site (Katz 1995), although some artists used drawings as the finished product (Hislop 2013; Adams 2013).

Watercolour is a delicate material that dries lighter and faster than oils, but lacks depth in tones and is suitable for painting of moderate dimensions (Andrews 1989, p. 37). Unlike water colours, oil paints incorporate valuable rich pigments suspended in dried oil, and would usually be mixed by the artist as needed (Harrison 1920; Elkins 1999; Carlyle 1995, p. 3; Townsend 1995, p.182). As a medium, oil was not suitable for outdoors use until in the 1840's when oil paint was manufactured in tubes providing flexibility and usability outdoors (Elkins 1999; Katz 1995, p. 159; Bell and Lyall 2002, p. 120). Watercolours could be used on site, but required more time in the field and a section of the artists' studio needed to be transported there. Records for the paintings give no indication as to which were painted in the field and which were transformed from sketches that would inevitably lead to further distortion

within the product. Occasionally, artwork would be converted using lithograph techniques to produce multiple copies as prints.

3.7 Methods

The era of the study was divided into three periods: (i) the early arrival of artists (1804-1830), which offers the depiction of a new environment to the migrant artists; (ii) the emergence of Tasmania born artists (1830-1860); and, (iii) as the settlement matured so did artwork in conjunction with photography (1860-1900).

Artists were categorised into professional artists, government employees and convicts. Social background divided the individuals who were transported to the island as prisoners from others who emigrated by free will for the sake of economic benefit or as part of their professional duties.

The artistic media were classified into: drawing, watercolour, oil, and lithograph. In the case of lithograph, it is the original artist rather than the lithographer who is acknowledged. Development of a digital database to geo-reference the location from which a given artist portrayed his or her scene was achieved partly through visual inspection and site visits. The photogrammetric technique (chapter 2) was used to calculate the exact location if necessary. Otherwise, geo-referencing involved the identification of corresponding points on the art work and on a Google image, then using overlays and geometrical techniques to verify the location of the artist.

Digital topographic data were extracted in the Geographic Information System (GIS) format as shape files[7] and utilizing ArcMap applications for spatial analysis. ArcMap applications are widely used for management of spatial data and for

[7]http://general.esri.akadns.net/news/ArcUser/1002/files/dynseg_2.pdf.

undertaking spatial analysis as well as visual analysis, and have been successfully employed by other researchers in study of visual representation of landscape (Tsukamoto et al 2004). Spatial analysis is concerned with the manipulation of spatial data and the extraction of both spatial relations and properties of features. In another study conducted by Ramos and Pastor (2012) data of geographic attributes were integration into GIS, enable mapping the visual landscape quality in Europe. Data points for the locations from which the artists portrayed the scenes were converted to a GIS layer. Attributes associated with each image included name of artist, the title of artwork, year of production and medium. This layer was linked to a further database containing details of artists including background, gender and social status. Polygons were created for each geographic location (Figure 3.1). In addition, the number of artworks produced is examined which may reveal relationships with location of production (Figure 3.3). Locations used by artists were investigated in relation to each individual's social status. Spatial data and its associated attributes in GIS provided the bases for undertaking of further analysis. The Chi square test was used to determine the significance of associations between the social status of the artists and the medium with the expectation that the distribution is random. The artworks were tabulated by year of production, gender and medium (Table 3.1).

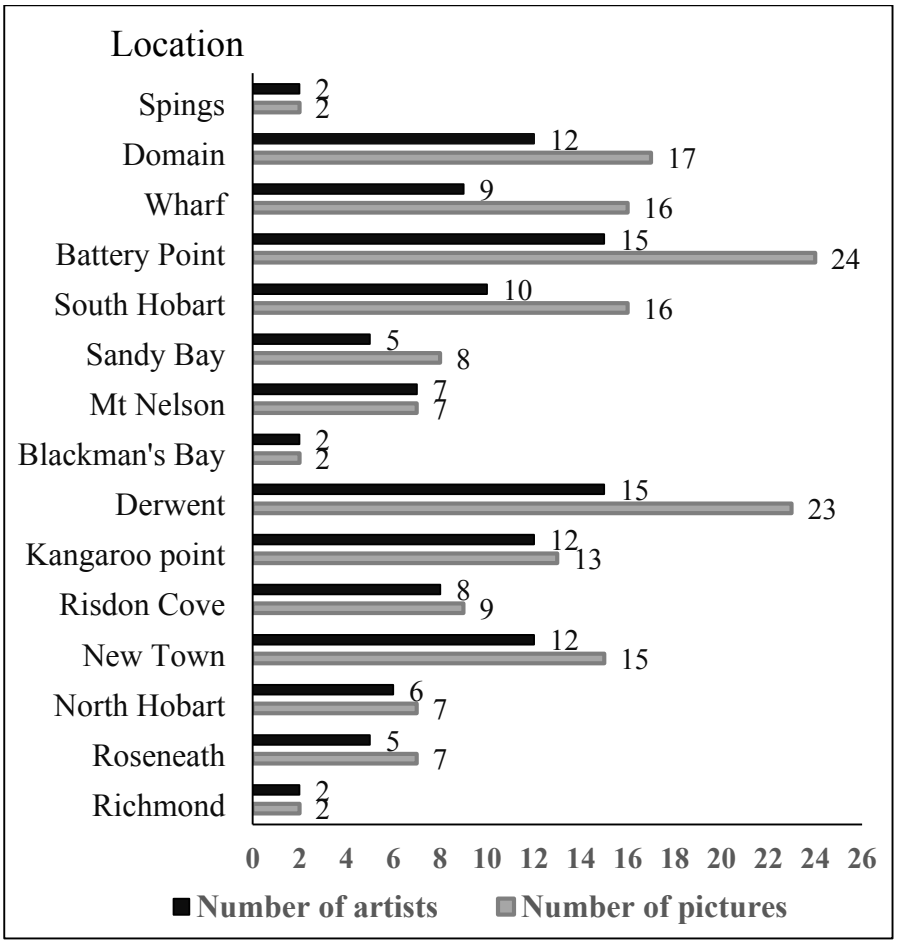

Figure 3.3: Artwork production at different location in relation to number of artists produced them (locations mapped in Figure 3.1).

Table 3.1: Summary of the number of artworks in different media by female (F) and male (M) artists throughout the century.

year	Female- works	F-drawing	F-watercolour	F-lithograph	F-oil	Male-works	M-drawing	M-watercolour	M-lithograph	M-oil
1805	0	0	0	0	0	1	0	1	0	0
1815	0	0	0	0	0	0	2	0	1	0
1825	1	1	0	0	0	10	1	8	0	0
1835	2	1	1	0	0	36	15	15	14	5
1845	12	1	9	0	0	43	4	18	7	2
1855	6	6	1	0	0	21	1	14	3	8
1865	4	0	1	0	0	14	6	4	1	1
1875	1	4	1	0	0	7	0	1	0	4
1885	1	1	0	0	0	13	0	1	0	1
1895	0	0	0	0	0	3	0	6	0	4

3.8 Results and Discussion

Access to all 19th century landscape artworks of Hobart was an impossible task. Many artworks would have been discarded or destroyed, while others would be inaccessible in private collections. In cases of absence of original maker or the date of production, the piece was not included. It is assumed that the one hundred and seventy-five artworks which were accessible are representative of higher quality artworks as a whole. Initially the number of artworks produced increased with population growth to peak in the 1840's, and then dropped abruptly (Figure 3.4). The rate of increase from 1820 coincides with a time of change in regulations concerning land ownership that allowed immigrants of means to take land titles. Thus, free artists could migrate and also art will have been employed to advertise the opportunities for migration to a new environment.

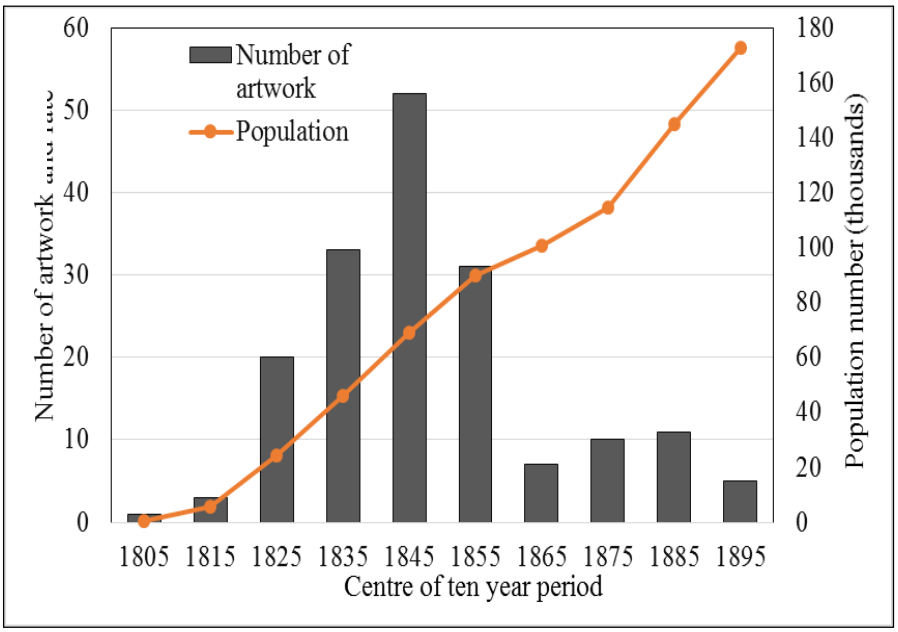

Figure 3.4: Number of artworks produced per decade and population[8].

[8] http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3105.0.65.0012006?OpenDocument.

Continued increase in the production of artwork into the 1830s coincides with economic progress in Tasmania under Governor Arthur, indicative by the high legal interest rate offered by the private banks which was regarded as the highest in the English empire at the time (Pike 1962, p. 70).

The high number of artworks in the 1840s was partly due to certain individuals efforts. In particular, Prout who arrived in Hobart in 1844, delivered lectures on art and formed a club for contemporary artists that went out on sketching expeditions around Tasmania. Prout organized the first art exhibition for paintings in Tasmania and in Australia as a whole (Hodgman 1967). He returned to England in 1848 to sell his depictions of scenes of Australia in London. In order to avoid bias in the result, the contribution by Prout was removed from analysis, however, the production of artwork in 1840s remained at a peak (Figure 3.5).

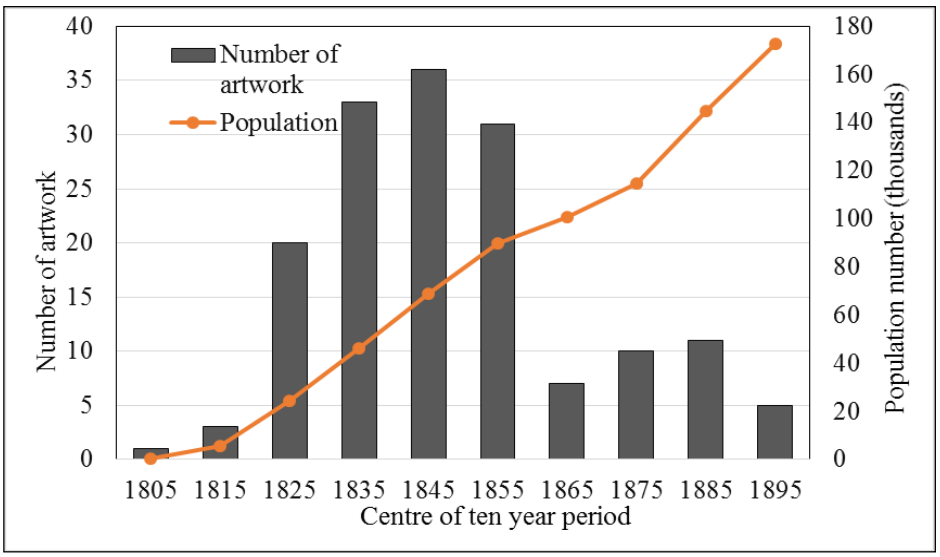

Figure 3.5: Number of artworks produced per decade (Artwork by Prout is removed) and population.

A number of events are likely to have contributed to the decline of artwork from 1850. For example, the popularity, cheapness and reproduction capabilities of photographs are likely to have had significant effect on the art market (Brik 1926). Of the artists in Tasmania, both Bull and Gritten became photographers. Also, the gold rush in Victoria attracted lots of men, including artists such as Gritten. However, production by females also declined. Macintyre (1999) pointed out that throughout the century Tasmania continued to receive new settlers to reinforce the English colony, but there may have been some throughput as people moved on to the mainland. There is a small peak in art production of art in the 1880's, which coincides with large population growth on the island.

During the last three decades of the century there was an economic depression in Europe including Britain (Musson 1959) leading to significant decline of artwork in the major market, which had been established from 1851 through a series of World Fairs (Rydell 1993).

Inspection of social status and the locations used by artists (Figure 3.1) showed some connections. The wharf area to the centre of Hobart was popular location among Government workers, whereas Old Beach was avoided by convicts. Locations central to Hobart such as the Wharf, and the Derwent were used by many artists (Table 3.2) throughout the century. These locations were easily accessible and a focus for many industrial activities in the area, including the whaling industry that brought commercial gains to the locals (Chamberlain 1988, p. 133). These locations also offered picturesque landscape through the rising hills, rivers and trees surrounding the city.

Water colour was the popular medium among female and male artists (Figure 3.6) with women producing 69% of their work in the medium, whereas men produced

52% of their work in water colour. Oil paints were utilised by only male artists and only the work of male artists were converted to lithograph.

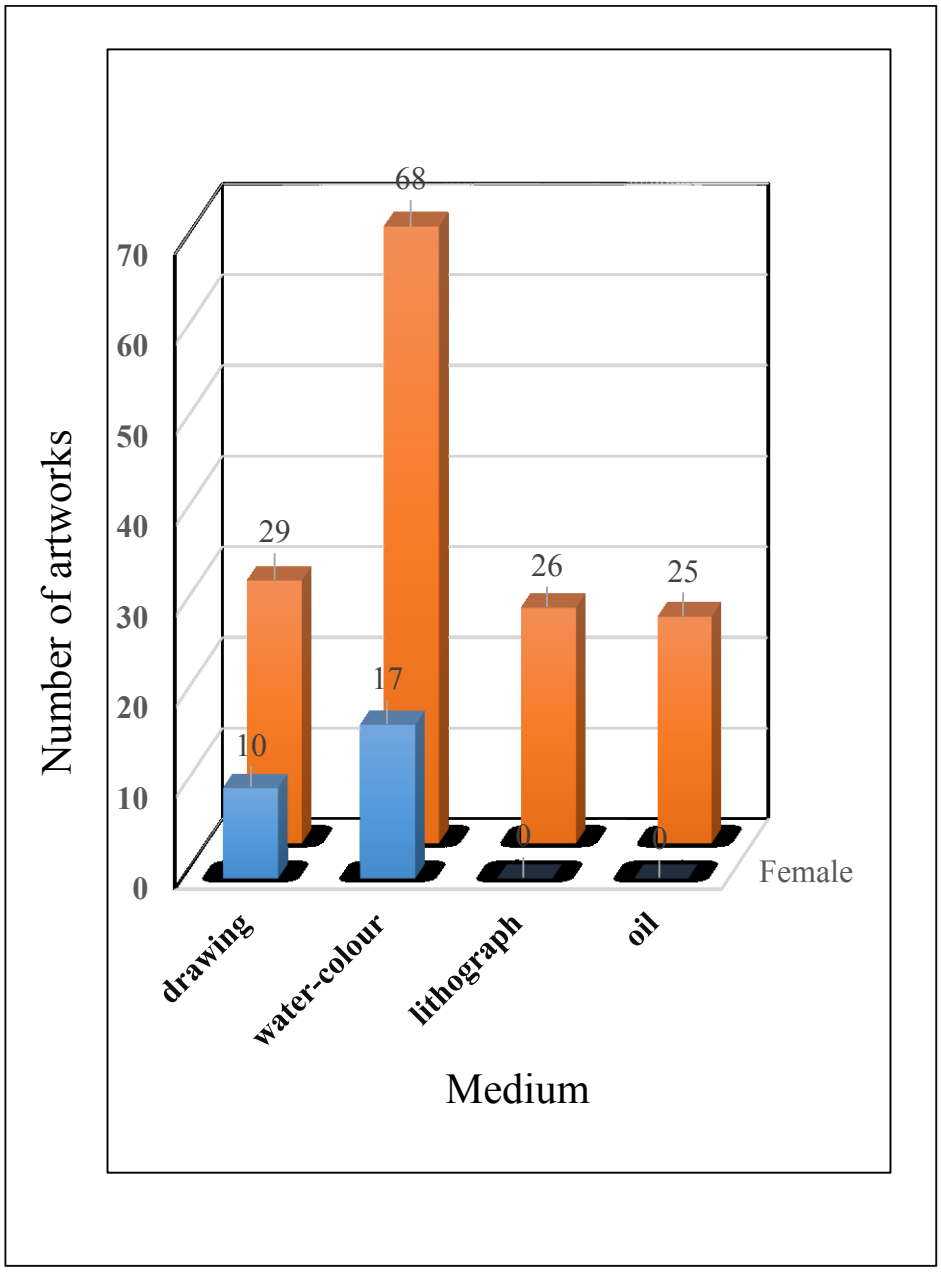

Figure 3.6: Production of artworks in relation to gender and medium used.

Scenes tended to be depicted from lower terrain looking towards the hills and mountains and often across the water of the River Derwent. However, 15% of the artists break this trend with their scenes being portrayed from the hills above Hobart.

Two of those artists were former convicts. Knut Bull, in his oil painting, "*Entrance to the River Derwent from the Springs, Mount Wellington*" (Figure 3.7), which depicts a view to the southeast from Knocklofty painted from amongst the trees of an inspiring dawn. Perhaps he was hoping for a change in his life. Similarly, another work by the water colourist Lycett "*View from Mount Nelson with Hobart Town in Distance*" (Figure 3.8) typifies the western shore scenes from an elevated position.

As the century progressed the views that were depicted used locations more remote from the centre of Hobart. Development of new areas around the outskirts of the city enabled artists to travel further afield to embrace the changes of their surroundings. There are a few notable exceptions of scenes painted at some distance from the early settlement, such as the work of Lycett, shown in Figure 3.8. In this case Lycett had travelled on the established path to the signal station at the top of Mount Nelson. This indicates the apparent need for a communications route to exist as a requirement for travelling beyond the city limits to paint.

Of the total sample of 57 individuals producing artwork, the professional artists constitute 70% of producers and their contribution was 64%. The Government workers represent 21% with a contribution of 24% of the work, while 9% of the artists were convicts or ex-convicts, producing 12%. This statistic indicates that on a pro rata basis, the output of the amateurs was more than equivalent to that of professionals and that the amount of work produced by each group approximates the size of the group. Work by 12 of most prolific artists was well-distributed between sites. However, Earle, a professional artist, produced all of his work from one location at Battery Point. Generally, male and female artists worked throughout the region (Table 3.2). Mary Morton Allport produced more artworks than other females.

Figure 3.7: '*Entrance to the River Derwent from Springs*', by Bull, 1856.

Figure 3.8: '*View from the top of Mount Nelson with Hobart Town in Distance',* by Lycett, 1825.

Table 3.2: Number of artworks by some of the most prolific artists at the popular locations (shown in Figure 3.1) are: 1. Female artist, 2. Male Convict 3. Male Clerk 4. Male Teacher 5. Male Artist 6. Male Surveyor 7. Male Sea Captain 8. Male Military Officer).

Location	Allport[1]	Bock[2]	Boyes[3]	Bull[2]	Chapman[4]	Cleburne[1]	Earle[5]	Evans[6]	Forrest[7]	Lycett[2]	Mansfield[8]	Prout[5]
Blackmans Bay												1
Battery Pt		1	1		1		6			1	1	3
Richmond	1				1							
Springs				1								
Mt Nelson		1	1							1	1	1
S. Hobart	6		1	1				1	2			1
Newtown			2	1	2					1		3
Old beach						3						
N. Hobart		1						1				1
Derwent		1	1	1	1			1	2	1	1	2
Domain	1		1	1				1			2	1
Sandy Bay	3									1		1
Kangaroo	1				1					1		1
Roseneath	4									2		
Risdon		1				1				1		
Wharf					3			1			7	1

Watercolour paintings were produced by 40% of the artists, and oils by 23%. Different media peaked at different times (Figure 3.9). During the 1820's watercolour works dominate. These were largely produced by the traveller Earle and the convict Lycett. Through the 1830's lithographs became popular with 70% reproduced in this medium from works by eleven artists of varying backgrounds. Five of these artists worked in other media as well. It is likely that lithographs became fashionable in this decade.

Works in the 1840's constituted 30% of the total 175 pieces of artwork found from the 19th Century. Production was dominated by three artists; Prout, who produced 50% of work, Allport who contributed 17%, and Mansfield who produced 25%. All of the work by Mansfield was produced in one year, 1844. From 1850 there was a range of artists both male and female, with a different backgrounds leading to unequality between media utilised. For example, Bull and Gritten painted in oil whereas Cleburne and Bowring produced drawings and watercolours.

Of the total 57 selected artists producing work throughout the century, 41 were professional artists, 11 were in the government service and 5 were convicts**.** While these groups differed in their use of media (Figure 3.10), Chi-squared= 22, d.f.= 6, $P<0.001$, the government workers, artists and convicts followed similar trends in their selection of sites. Of the work produced by artists 51% were in watercolour (Figure 3.6). This bias is due to prolific artists including Prout and Allport (combined contribution of 23%), working almost solely in watercolour, which is faster to produce than work in oils. Otherwise, drawings account for a further 27% and works produced in the other two media are distributed equally. Drawing was popular

amongst government employees with 43% of their works produced with pencil and paper. This result was largely influenced by the military personnel and is probably due to practicality and training, which incorporated drawing skills for purposes of survey and mapping the Imperial properties (Gooding 2007).

The dominant medium used in works produced by convicts was distributed equally between oils and watercolour (Figure 3.10). It is interesting to realise that former convicts worked in watercolours and oil, while teachers used the cheaper medium of pencil. In Europe and United States oil paint was predominantly used by male artists in the last quarter of the 19th century (Wein 1981). Throughout the century in Tasmania, there were no landscape oil paintings produced by female artists.

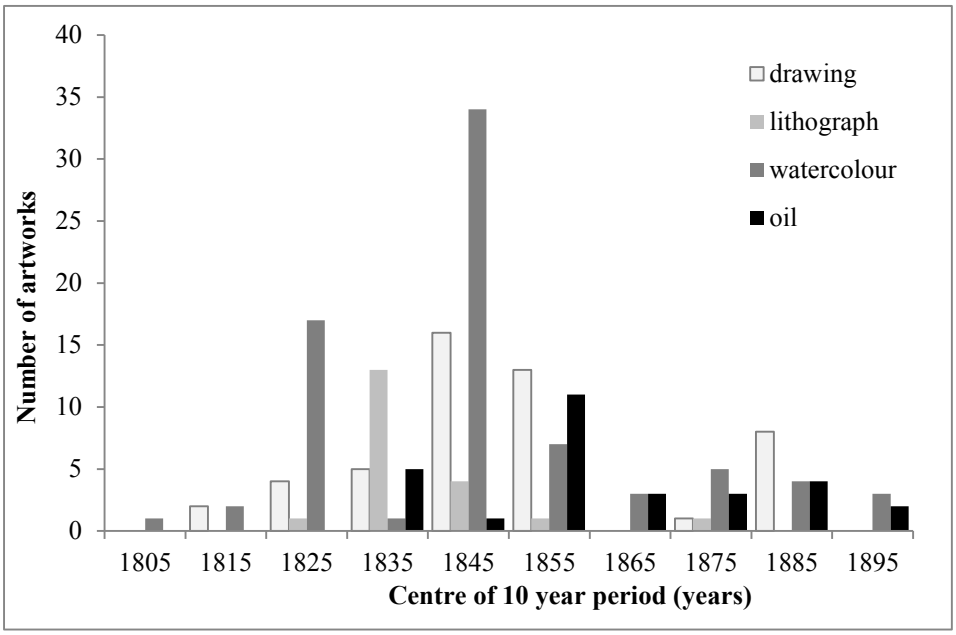

Figure 3.9: Number of artwork in different media (drawing, lithograph, water colour and oil) by decade.

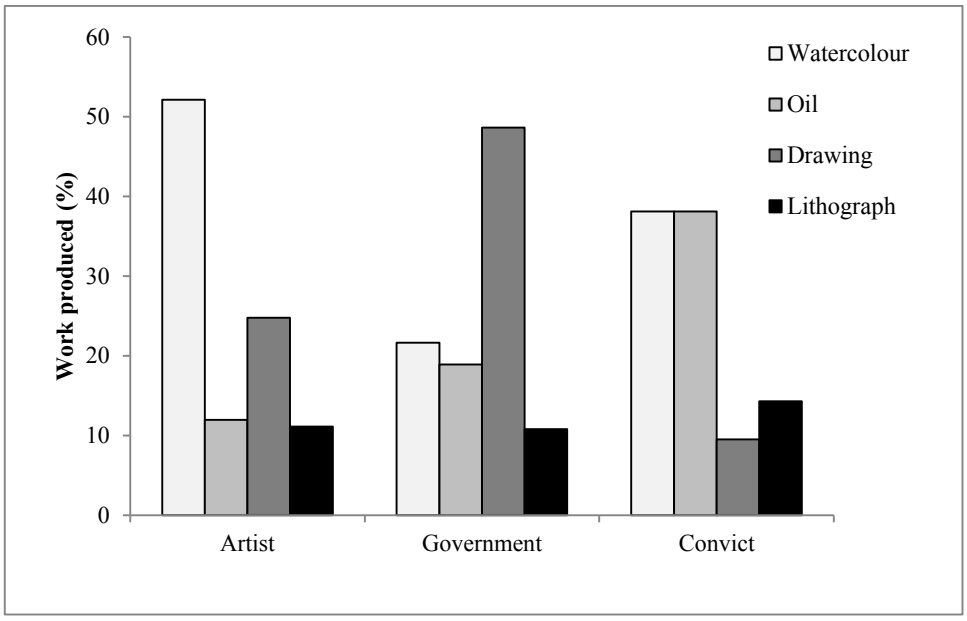

Figure 3.10: Artworks in different media and artists of various background.

3.9 Conclusions

From the initial time of settlement, the beauty of the Hobart landscape with its intimate juxtaposition of mountains and sea, led to portrayal of the city and its surroundings by numerous artists from various professions. These portrayals varied in medium used and style. Medium was strongly influenced by profession. Governments' workers produced landscape in drawing. The military persons and surveyors depicted features of the environment both of nature and man-made elements, providing valuable representations of the city and its topography (Gough, 2009). The convicts' artworks can be regarded from a different point of view. Interestingly, they depicted various scenes and used different sites providing wide ranges of views of the city and its environs. Some recorded historical events such as the first magnetic observation site on the island. Social class was an important factor in Tasmania as in many places at the time (Matsen 2008; Wein 1981; Helmreich

2000). Only females from upper middle class produced artwork, which conforms to the tradition of the English society at the same period.

Tradition encompassed landscape as a masculine subject, whereas women were confined to flowers, portraits and cottages. In Tasmania, female artists seceded from this tradition including full landscape into their forte. Thus, some gained respectful reputations as artists, participating in local exhibitions. Artists were afforded opportunities to paint a wider array of landscape views embodying places they resided and visited. Australian artists, born in Tasmania, embraced depicting features associated with local cultural landscape. Social status and background bore no influence on type of work and media used among male artists. As expected, gender strongly influenced the medium used by women who drew and worked in water colour rather than in oil.

The quantity of artwork produced peaked in 1840s, not necessarily due to demand for art, but rather because of the effort of individual figures such as Mansfield, Prout and Allport.

Initially there is also correlation between the number of pieces produced and the growth rate of the population of Tasmania. A reduction in the amount of work produced in later decades relates to external events. While the population continued to increase on the whole there was some mobility to the mainland that coincided with the introduction of photography. A greater rate of population growth towards the end of the century again correlates with an increase in productivity of art work.

Chapter 4. A quantitative classification of the content of historic landscape art

4.1 Introduction

The historic value of landscape artworks is widely recognised (Smith 1984; McLoughlin 1999; Scazzosi 2004; Mitchel et al 2009). In obtaining historic information from paintings there is a need for awareness of differences between artists and eras in the selection of scenes and in the composition of the elements that make up scenes. Differences between historical eras and cultures in the norms of composition of landscape pictures are well-known reflections of society, culture, environments and the tastes of the artist and their market. For example, in 18th century Europe, people and stock were featured in almost all paintings (Paulson 1975; Gaiger 2000; Whyte 2002) while in 16th century China, misshapen trees and pagodas were common elements of landscape art (Casey 2002; Law 2011).

The 18th century English landscape paintings featured lush green trees, hills and rivers in the background (Cosgrove 1985; Bermingham 1986). An elegant building was often added to demonstrate the status of the human subject. In such instances, the surrounding landscape might be used to offer a dimensional perspective to the primary features. In Chinese paintings, the landscape is a representation of relationships between earth and heaven, within which features are usually repeated. Human figures, trees or a temple were depicted with no regard for geometric rules (McMahon 2003; Zhang 2013). McMahon (2003) pointed out that people were displayed engaging in the tasks of their daily life, such as planting crops, travelling,

worshipping and fishing, in a landscape showing their village and huts on surrounding hills. These paintings demonstrated the cosmic order of harmony between man, earth and heaven (Sullivan 1962, p. 5).

During the era of the British colonial expansion, artists, such as John Constable, (1776-1837), idealised the English countryside in paintings (Rosenthal 1983), while artists who travelled to the new lands depicted untamed landscapes that were waiting to be civilized and developed (Bonyhady 1987; Whyte 2002).

William George Evans (1780-1852), a government official, produced a view of newly-colonised Hobart in 1804 depicting heavily forested land almost impossible to penetrate. Twenty years later, Lycett painted development in progress, with the English flag high on Mount Nelson, the signal point of colonialism and a sign of sovereignty over the landscape (Ciarlo 2011) and an ideal location for surveying the parcels of recently cleared land. Land clearance was the archetypal activity of early European settlement (Whyte 2002; Boyce 2008).

Beside the depiction of features of the physical landscape, atmospheric effects were regarded as important in 18th and 19th century art (Thomas 2006; Wood 2007). Monet (1840-1926)[9] wrote that "*landscape does not exist in its own right, since its appearance changes at every moment; but the surrounding atmosphere brings it to life the light and the air which vary continually. It is only the surrounding atmosphere which gives subjects their true value'*. John Ruskin (1819-1900) stressed the importance of careful observation of natural elements including the clouds and

[9] http://www.theartstory.org/artist-monet-claude.htm, viewed 21/11/14.

the sky (cited in Cosgrove 1979, p. 57). Turner's depiction of the storms, and Constable's clouds (Thorne 1999, p. 194; Archer 2013, p. 972) provide different meteorological realities in comparison to those painted by Piguenit of the southern hemisphere sky. In all instances, the natural atmospheric elements constituted a large part of their paintings.

When depicting an idealised landscape in the Arcadian style, artists excluded certain features from the scene (Geddes 2011). In this and other traditions, different artists are likely to have emphasised different features to depict lifestyle, development and environment in the newly occupied island of Tasmania. In one of the very few statistical approaches to the content of artworks, Hughes et al (2011) determine the similarity of artworks from different backgrounds, cultures and times. Artworks were divided into cells and sophisticated algorithms based on frequency response of the spectral content of each cell were used to classify images. Their technique distinguishes between abstract and landscape art, but is less reliable at differentiating portraits from other types of paintings. Differences between individual artists were not assessed. The fact that there are experts who can distinguish the work of particular artists from that of other artists is partly because different artists vary in their compositional content, although the nature of these differences remains unquantified.

There has been considerable discourse on compositional variation in landscape artworks (Stork and Johnson 2006; Speher 2009). A few authors have undertaken qualitative analyses of content. There has been no attempt to use repeatable quantitative techniques to test the individual content signatures of artists. Artwork

has previously been used as a record of events, developments and original condition. Our central interest is in using artwork to elucidate the way in which people perceived their surroundings and achievements as Hobart grew from tents full of soldiers and convicts, to a respectable city. This question was explored by assessment of the features that were depicted by the contemporary artists, who came to the island from a variety of backgrounds.

The major objectives of the present chapter are to determine the types of combinations of features depicted in picture and to relate the resulting compositional types to time, medium, gender, background and individual artist.

4.2 Methods

The following sections; 4.2.1, 4.2.2 and 4.2.3, present the database, typology of elements and data extraction and analysis in that order.

4.2.1 Database

The raw materials are described in Appendix A.

4.2.2 Typology of Elements

Objects are recognizable even when manipulated by artist (Lopes 2003). Features of the natural and cultural landscape were categorized into fifteen categories; water, sky, hills, rocks, grass, urban, forest, lawn, garden, pasture, sheep, cattle, people, ships, and cleared land. Observation of the real world suggests that boundaries between some features can be sharp, but others are less well-defined. This variation is reflected in art work (Harrison 1910). Some judgement on boundaries between different features was required where they had fuzzy borders.

Hills were readily identified in the paintings as curved lines in the landscape with a distinct colour, without other shapes intersecting the curves. An area of dense tree cover was identified as forest where branches, leaves and single trunk, illustrated by brush strokes and shapes could be clearly distinguished.

In drawings where the outline of trees was observed, usually with a crown, the area was also classed as forest, for example, the work of Mansfield James William (1824-1870) entitled "*Mount Wellington from Old Wharf*".

Each region of a painting was allocated a unique category. Where hills could be distinguished as forested, grass, cleared or rocks they were categorised as such, but as a background feature the make-up of hills could not be further identified and remained as hills.

Turner provided careful observation of rocks (Barnard 1871, p.193). Rocks were depicted at various scales and shapes. The present study used the work of Mary Morton Allport, "*Government House from Sea*", as a guideline for the identification of rocks. Rocks were common element appreciated in Japanese gardens (Kuitert 1988). From geological understanding, rocks are indicators of mineral resources and economic prospective, as a feature, it became important element in art (Heringman 2004, p. 20). Occasionally artists depicted rocks for their geometric properties (Keane 2013). Some parts could be hidden in the soil or under water, however, in the present study, only the visible part was considered.

Areas of grass were identified by uneven short brush stroke and lines, as in work by Boyes George Thomas William Blamey (1787-1853), "*Hobarton from Mt Nelson"*. Sheep occupy a significant part of some paintings, such as that by Bull (1854) in the

depiction of grazing sheep in '*View of Hobart from the Domain'*. Representation of cattle were based on work by Ashton Julian (1851-1942), *'Mount Direction and New Town'*. The presence of cattle was also used to differentiate between pasture and cleared land. Fences, which appeared in the region in the second half of the century (Henzell 2007 p, 64), were also used as indicators to define boundaries of areas dedicated to pasture. Natural grassland had a sparse population of short trees, unlike cleared land that showed signs of human intervention depicted by cut trees, bare earth or tree stumps in the picture. There are often trails included as in the work of Gritten '*Main Road and New Town'* (1856), where land beside the trail is shown as bare earth, and its situation with adjacent buildings suggests that clearance was in preparation for development. Areas depicted with an even layout of grass that was obviously maintained were categorized as lawn. These, were usually adjacent to a row of trees and often a house. Emily Stuart Bowring (1835-1912) in "*Mount Wellington*" provided an example of a manicured lawn surrounding a home.

Finally, the space on the canvas given to each of people and water vessels was discriminated.

4.2.3 Data extraction and analysis

Plot Digitizer[10] software was utilised to measure the area of each category in each painting. Each image, in JPEG format, was individually scaled to 100 units, regardless of the size of picture as shown in Figure 4.1. Features were digitized using

[10] http://plotdigitizer.sourceforge.net

the semi-auto module and the area of the polygon computed. The total area of each category was expressed as a proportion of the total area of the picture.

The percentage cover of categories in pictures were used as the input to a classification of the 175 artworks. A hierarchical agglomerative algorithm was applied in which each individual begins in its own cluster; clusters are then paired and successively merged in order of similarity (Stan and Serhi 2001, Bin Samma and Abdul Salam 2009). The similarity measure is the square of Euclidean distance. In obtaining a minimum variance of clustering the dendrogram was calculated using the Ward's method for optimisation of the error sums of squares (Burmester 1983; Jongman et al 1995, p. 191). In this method, the distance between clusters is the average of the distances between their components.

Results were examined in the form of a dendrogram, a tree like diagram, which show s hierarchical classification (Gaugh 1982, p. 195), in this case it showed a steep increase in distance values between 5 and 9 groups. Using six clusters put a large number of pieces (27%) of artworks into one cluster. Introducing a seventh cluster separated this one group into two with all other clusters remaining unchanged. However, increasing the number of clusters to eight reduced one group to eight paintings and a number of paintings were redistributed between the other clusters, therefore, the seven cluster solution was adopted.

This classification was used as the initial estimate for re-classification using a K-means clustering algorithm. K-means is non-hierarchical and, using initial clusters, assesses observations, again using Euclidean distance squared as the parameter, moving observations between groups until a final solution is reached (Ece 2004;

Huang et al 2005). As a non-hierarchical method, K-means requires an initial estimate of clusters. After application of the K-means algorithms, the groups were better defined in terms of the spread within each cluster and distances between clusters. Under the reclassification of the data using the K-means clustering method, forty-six paintings shifted groups from their initial classification. The average square Euclidean distance within clusters was reduced by 10% in comparison with Wards method. The grand centroid is the overall mean for the feature when considering all paintings.

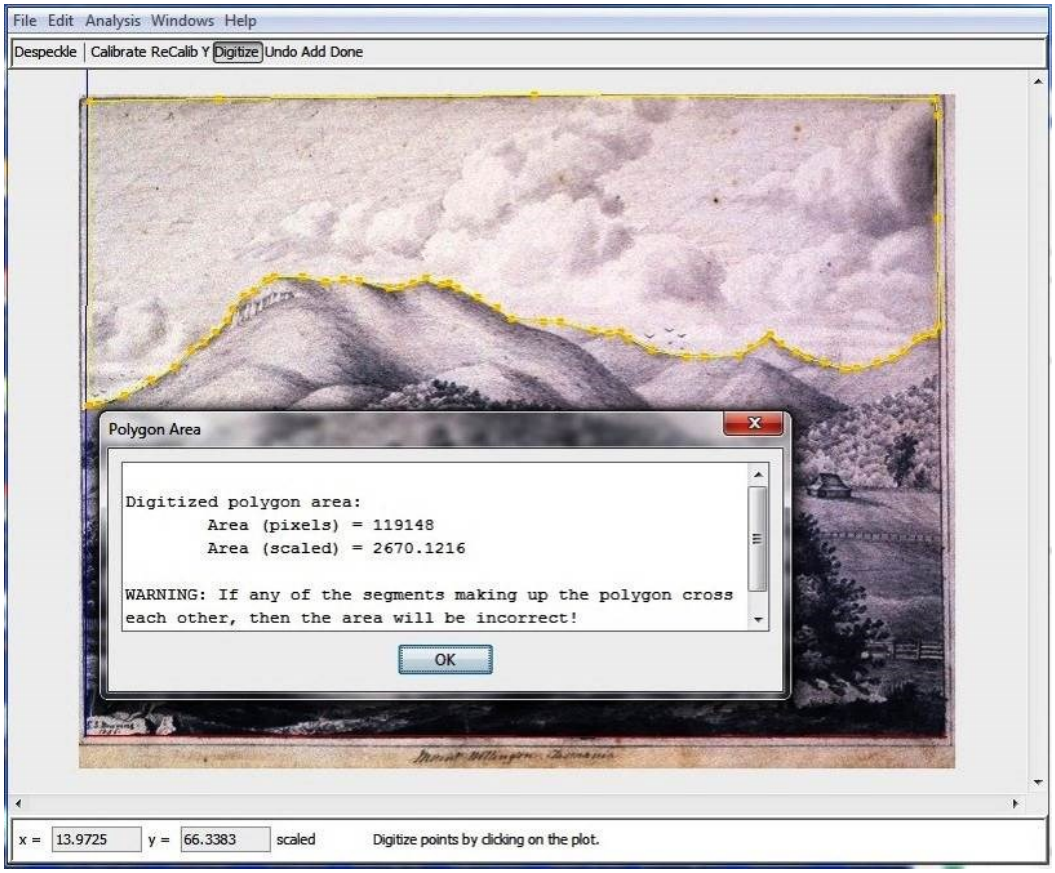

Figure 4.1: An example of feature digitization and calculation.

Chi-squared analysis was used to test whether there were relationships between grouping of artworks based on features and each of the background of the artists, social status, gender, period and selection of media (see Chapter 3 for a description of these groups). In performing the chi-squared test, expected values are generated using a uniform distribution with values corresponding to proportion of members within a social class, or ratio of paintings produced using the different media.

4.3 Results

The number of works falling into each of the seven clusters is shown in Figure 4.2. In cluster 1, the dominant features were water, hills, urban and gardens, as the centroids for these features are above the corresponding grand centroids shown in Table 4.1. In cluster 2, the features that were in excess of the grand centroid were hills and ships. In cluster 3, a larger than typical amount of canvas was committed to grass, lawn, gardens, sheep, people and cleared land while rocks also featured heavily. Cluster 4 had above typical values for sky and ships. Cluster 5 had high proportions of pasture, sheep and cattle. Cluster 6 had more than typical proportions of rocks, grass and forest. Finally, cluster 7 has sky, forest and people as dominant features (Table 4.2, Figure 4.3). There is a greater mean and also a greater spread in variables such as sky and water in comparison with that of other features such as sheep and water vessels.

Different artists emphasised different elements in their work. The paintings of Bull, who was a convict, on average contained half sky and works of Gritten, a photographer, were just 3% less. Lycett painted forest, while Murray Alexander Sutherland (1852-1902) emphasised water. In some instances there may be a

connection with individual interests. For example. Glover and Allport who both settled in Tasmania to make home and farm, offer more gardens within their works than any other artists

Artists with multiple works tended to be concentrated in particular clusters. The artists who best characterised the clusters were Mansfield in 1; Duterrau, Murray and Earle in 2; Prout and Allport in 3; Ludwig, de Wesselow and Piguenit in 4; Evans in 5; Boyes in 6; Lycett and Cleburne in 7 (Table 4.3). Although there was a tendency for works by females to be concentrated in clusters 2 and 3, this variation did not deviate from the expected ($\chi^2 = 6.9$, df = 6, p = 0.35). The variation between clusters by artist background was highly significant ($\chi^2 = 24$, df = 6, p = 0.001), with the work of convicts 3.4 times greater than that of free settlers in cluster 7.

Convicts produced substantially more work than expected in cluster 5 (Table 4.3). There was no differentiation between artists and government officials in the distribution of their paintings between clusters (χ^2=4.57, df = 6, p = 0.60). There was strong differentiation between clusters in the period of creation of artworks (χ^2 = 24.0, df = 12, p=0.02). Clusters 5 and 7 were concentrated in the first period, clusters 1 and 3 in the second period and clusters 4 and 6 in the third period (Table 4.3).

There was strong differentiation in the choice of medium between clusters (χ^2= 53, d.f. = 18, p < 0.001). Drawings were more frequent than watercolour in cluster 1 with the roles reversed in cluster 3, and more watercolours than expected in cluster 2. Lithographs were more frequent in cluster 2 than they were in cluster 5.

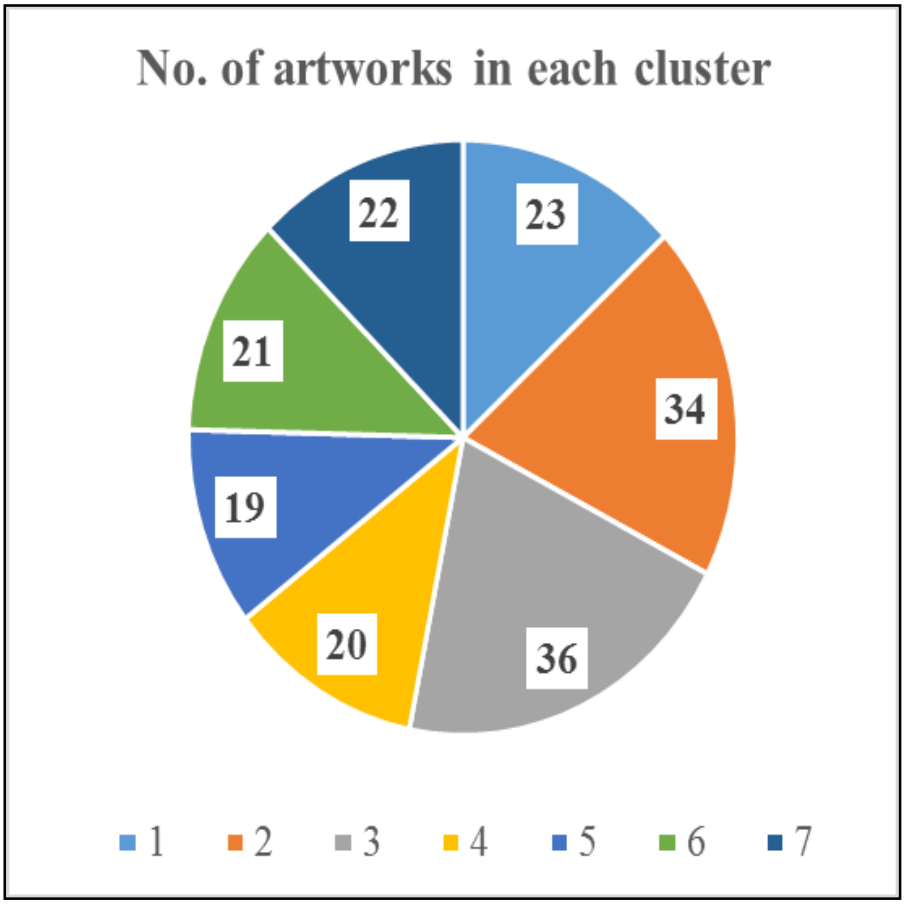

Figure 4.2: Number of artworks in clusters.

Table 4.1: Cluster centroids as percentage area of a painting dedicated to particular features, (numbers in Bold represent features greater than the Grand centroid).

Feature	Cluster							Grand Centroid
	1	2	3	4	5	6	7	
Water	**25.61**	3.53	**23.49**	4.10	4.70	0.00	**14.26**	**12.34**
Sky	30.34	30.32	**40.52**	**46.61**	**36.58**	25.24	**41.80**	**35.89**
Hills	**12.04**	**14.12**	9.85	8.68	**10.17**	8.56	2.54	**9.77**
Rocks	1.63	**4.23**	**6.83**	2.28	1.72	**6.89**	3.02	**4.07**
Grass	0.58	2.08	**8.45**	0.59	2.23	**7.00**	3.38	**3.74**
Urban	**24.049**	4.46	6.74	4.20	**8.02**	5.00	2.84	**7.72**
Forest	10.49	9.45	7.25	4.15	12.85	**36.50**	**21.36**	**13.61**
Lawn	0.96	0.49	**2.77**	1.05	0.99	0.33	0.84	**1.17**
Gardens	**3.97**	0.43	**2.54**	0.00	0.02	0.00	0.00	**1.13**
Pasture	0.79	1.56	1.01	0.45	**18.60**	0.53	2.74	**3.09**
Sheep	0.00	0.00	**0.02**	0.00	**0.02**	0.00	0.00	**0.01**
Cattle	0.00	0.06	0.06	0.02	**0.51**	0.06	0.01	**0.09**
People	**0.71**	0.69	**0.84**	0.48	0.47	0.55	**0.97**	**0.69**
Boats/Ships	1.46	**2.35**	0.91	**4.23**	0.30	0.33	1.39	**1.58**
Cleared land	**5.41**	4.74	**7.98**	3.26	3.11	4.42	4.37	**5.06**

Table 4.2: Mean percentage cover of elements by selected artists

Artist	Water	Sky	Hills	Rocks	Grass	Urban	Forest	Lawn		Pasture	Sheep	Cattle	People	Boats	Cleared-
Allport MM	12	33.4	11.7	7.3	5.8	8.2	6.7	2.0	**7.8**	0.0	0.0	0.0	0.2	0.3	4.8
Atkinson C	15	26.5	6.7	3.5	0.0	19.9	13.8	2.3	0.0	0.0	0.0	0.0	1.4	3.9	6.6
Augustus E	14	30.3	15.5	5.5	1.1	4.5	12.4	2.6	0.0	2.6	0.0	0.0	**2.2**	2.7	6.4
Beauchamp RP	8.0	30.6	**15.8**	**17.2**	4.3	3.7	14.4	0.0	0.0	4.5	0.0	0.4	0.2	0.3	0.0
Bock T	10.2	39.8	8.3	1.1	0.0	10.4	11.6	0.2	0.0	7.4	0.0	0.0	1.1	6.5	2.7
Bowring ES	18.3	40.4	4.8	0.5	1.0	6.8	6.4	12.5	1.3	5.2	0.1	0.0	0.1	0.6	1.4
Boyes GTWB	7.7	28.7	12.3	1.7	13.3	2.9	**25.4**	1.0	0.0	0.0	0.0	0.1	0.7	0.0	5.4
Bull K	6.2	**49.4**	4.0	8.1	3.7	2.7	17.5	0.3	0.0	4.6	0.1	0.2	0.1	1.0	1.2
Chapman TE	12.8	43.2	11.3	3.7	2.1	7.9	7.3	0.4	0.0	4.7	0.0	0.0	0.6	1.2	4.3
Cleburne SM.	10.1	41.1	8.5	3.7	7.8	2.3	21.7	1.5	0.0	0.4	0.0	0.0	0.0	0.9	1.7

de Wesselow S.	16.3	36.8	14.0	13.5	0.4	10.8	5.0	0.0	0.0	0.0	0.0	0.1	1.5	0.5	0.0
Duterrau B.	**20.6**	27.5	5.7	10.4	0.0	3.8	23.9	0.0	0.0	0.0	0.0	0.0	0.2	0.4	7.2
Evans GW.	6.9	43.7	3.2	1.5	0.0	5.1	17.7	0.0	0.0	13.9	0.0	0.0	0.1	1.2	6.3
Glover J.	6.1	35.2	5.9	9.4	1.1	6.9	18.5	0.0	**6.8**	7.0	0.0	0.5	0.8	0.1	1.7
Gritten H.	10.4	**46.6**	6.1	1.7	0.0	8.2	11.4	0.0	0.0	5.8	0.0	0.4	0.4	1.2	**7.8**
Ludwig S.	13.7	42.3	11.1	3.1	0.9	8.2	12.0	0.0	0.0	3.0	0.0	0.0	0.0	0.6	5.2
Lycett J.	16.6	40.5	1.1	2.3	3.4	2.2	**25.3**	0.5	0.0	5.8	0.0	0.0	0.4	0.5	1.1
Mansfield JW.	10.6	26.5	13.2	2.2	4.4	17.4	18.5	0.0	0.0	0.2	0	0.0	0.1	0.2	6.7
Murray AS	**25.2**	25.6	10.8	1.6	0.9	6.0	15.1	0.0	0.0	5.1	0	0.6	0.0	2.9	5.9
Piguenit WC.	13.6	36.3	**16.0**	1.1	2.2	6.8	11.9	0.0	0.0	5.5	.0	0.4	0.1	0.7	5.2
Prout SJ.	7.2	37.6	9.6	4.1	7.9	7.5	12.4	2.0	0.2	0	0.	.0	1.1	0.4	**9.8**

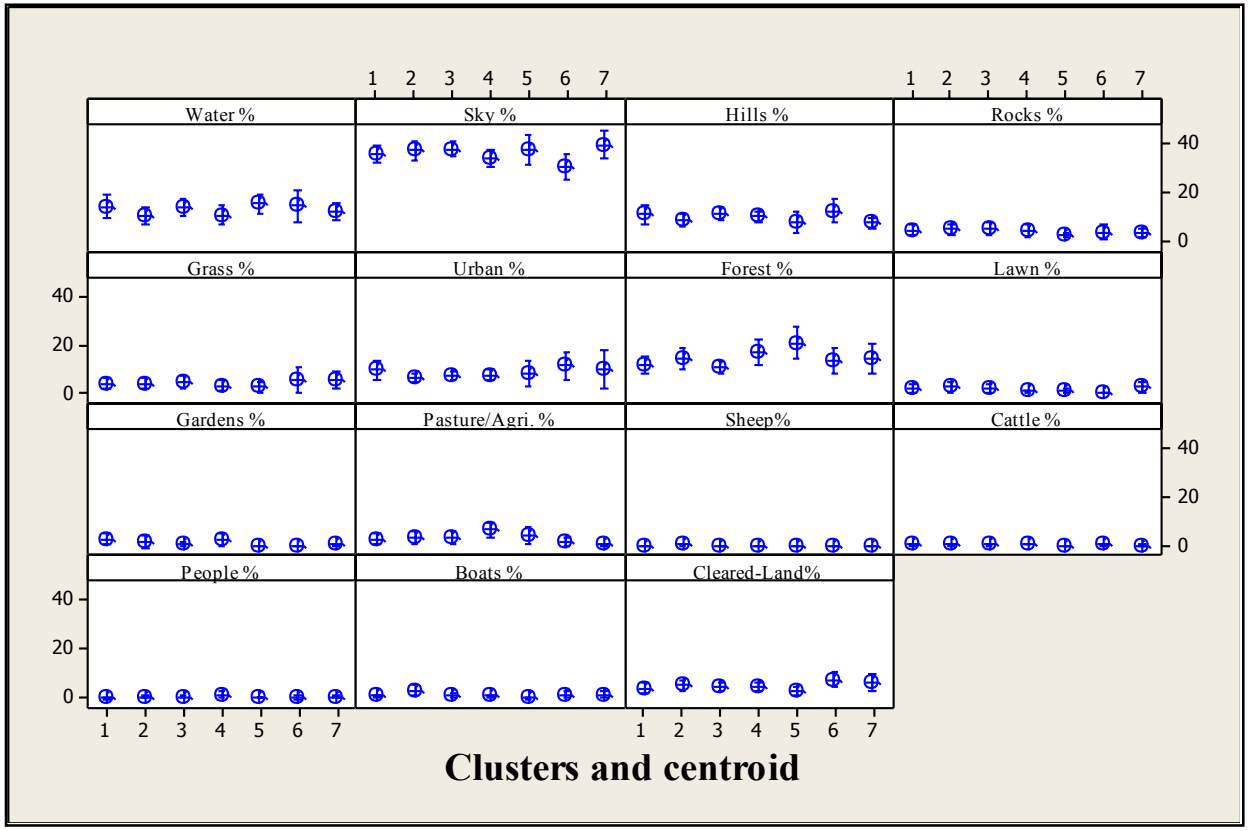

Figure 4.3: Means and 95% confidence limits for features depicted in artworks by cluster.

Table 4.3: Percentage frequency in clusters of the work of selected artists.

Artist	Gender	1	2	3	4	5	6	7	artworks
Mansfield W.	Male	**67**	8	0	0	0	25	0	12
Ludwig S.	Male	**40**	0	0	**40**	0	0	20	6
Atkinson	Male	**33**	**33**	0	0	0	**33**	0	3
Glover JR.	Male	**25**	**25**	0	0	**25**	**25**	0	4
Duterrau B.	Male	0	**75**	0	0	0	25	0	4
Murray	Male	0	**67**	0	0	0	0	33	3
Earle A	Male	17	**50**	17	0	0	17	0	6
Beauchamp	Male	0	**33**	**33**	0	0	**33**	0	3
de Wesselow	Male	0	**33**	**33**	**33**	0	0	0	3
Bock T.	Male	0	**25**	**25**	**25**	**25**	0	0	4
Bowring	Female	0	**25**	**25**	**25**	**25**	0	0	5
Prout S	Male	12	0	**53**	12	0	18	6	16
Allport MM	Female	14	36	**43**	7	0	0	0	14
Piguenit	Male	0	0	**33**	**33**	**33**	0	0	3
Chapman	Male	8	17	**25**	**25**	17	0	8	12
Gritten H.	Male	0	0	**25**	**25**	**25**	0	**25**	4
Bull Knut	Male	0	0	**20**	**20**	**20**	**20**	**20**	5
Evans GW.	Male	0	0	0	0	**67**	0	33	3
Boyes	Male	0	0	33	0	0	50	**17**	6
Lycett J.	Male	0	0	0	0	11	11	**78**	6
Cleburne SS.	Female	0	0	25	0	0	**25**	**50**	4

4.4 Discussion

The use of features to classify artworks into groups is novel. The main purpose was to identify whether artists from different backgrounds chose to paint scenes with distinguishable abundances of elements, which they did to some extent.

The large proportion of sky in the artworks of painters of disparate origin and inclination, may partly relate to the quality of the light in Tasmania. "*What anchored me here, initially, was the quality of the light, like an overexposed photograph, but possessing a clarity that I have not encountered elsewhere"* (Shakespeare 2009)[11]. Archer (2013, p. 973) pointed out that skies offered artists opportunities to capture the time dispersion of light and the luminosity of clouds. Among those artists who dedicated a large proportion of their paintings for sky was the convict, Joseph Lycett. His work depicting Hobart and its region was in water colour. Another interesting element in art was the depiction of gardens, which were highly regarded features of the ideal landscape (Bermingham 1986, p. 170). More particular interests may account for some of the results with Allport and Glover both offering more gardens within their works than any other artists. Both of these artists migrated to Tasmania as free settlers to make new homes, conveying to the viewers the tended and controlled nature in form of garden.

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[11] 'Tasmania, Outer Space on Earth', *More Intelligent Life,* viewed 9 June 2012, <http://moreintelligentlife.com/content/places/nicholas-shakespeare/above-down-under>.

The elements that occupy a small proportion of the art work are not necessarily included in all of the artwork within a cluster. For example, neither Allport nor Prout painted sheep, and yet a large amount of their work appears in cluster 3, which has a large centroid for this variable. Their work appears in this cluster due to other characteristics, and the centroid for sheep in cluster 3 is sufficiently close to 0 for their work to fall within this cluster.

Clusters and time periods were both subjugated by prolific individuals. For example, Lycett dominates cluster 7 and is prominent among the early colonial artists, as was Earle, who was strongly represented in cluster 2. The 116 pieces produced between 1830 and 1860 were dominated by an active group of artists led by Prout, who produced 16 pieces in watercolour himself and offered encouragement to others. His work was concentrated in cluster 3. Allport and Prout produced half of the works in this cluster, with Allport also is well represented in cluster 2.

After 1860, works are distributed more evenly between clusters. Dominant artists of the period include Piguenit, Ludwig, Bowring and Cleburne who all show less bias in the types of work that they produced, perhaps being less selective of their scene. While it is suggested that individuals dominated the clusters through choice of features, their own motivation may have been governed by the type of landscape they frequented or the requirements of their work. In the period prior to 1830, Lycett was painting sky, forest and people, with Earle depicting scenes of hills and ships. There was an abundance of space and perhaps the aim was to show the landscape with few people and ready means of transportation. After 1830 the works depicted larger than typical proportions of grass, lawn, gardens, sheep, people and cleared land. The

island was now flourishing with development, or at least that is how it was portrayed, likely with the intention of attracting wealthy investors. Later in this middle period, artists included more urban features. For example, Allport depicted the upper houses at Liverpool Street.

4.5 Conclusions

In the first study period, pictures depicted features illustrating the potential of development. A virgin land untouched by civilization, where the terrain covered by dense vegetation as shown in the work of Evans and Lycett. As a penal colony it was important to show that security measures were put in place in form of batteries which were constructed at strategic points such as Battery Point. Many artists used such locations to depict the open landscape. Subsequently, in the following three decades, elements in the landscape were depicted to show sources of wealth and industrialisation. Prout depicted cleared land and quarries, Allport depicted stone houses constructed over the hills. Features showing the final stages of shaping of the town were depicted by artists in the thirty years that followed. Such pictures provided a foundation for place identity. Distinctive compositional signatures of particular artists can be detected within these general tendencies, with background of the artist and the medium of the artwork both being reflected in compositional similarity.

Chapter 5. Mapping and dating forest clearance boundaries from 19th Century paintings, aerial photographs and modern map.

5.1 Introduction

In earlier chapters I utilized available techniques in a novel approach for assessing the accuracy of paintings of Hobart and analysed changes in subject matter and medium related to artist, the era, profession of artists and the gender of artists throughout the 19th century. The present chapter builds on this earlier work to demonstrate one way in which useful historical geographic analyses can be undertaken using the raw material of artwork.

An understanding of the history of land clearance is not only important in itself (Rackham 1980, 2003, 2008; Lindenmayer and Burgman 2005), but has relevance to management of vegetation in the present (Yates and Hobbs 1997). Areas that have been cleared have been reinvaded by native vegetation affecting the growth of other plants often creating distinct communities differing from uncleared communities, which occur in similar environmental circumstances (Peter 1978; Archer 1989; Leeson 2011). For example, Leeson (2011) investigated re-vegetation of cleared land in 18 different locations in comparison to controls in several different vegetation types in Tasmania. He showed different successional trajectories between re-vegetating cleared land and uncleared vegetation.

Data extracted from aerial photographs are useful in reconstructing the history of deforestation (Campos 1989). Prasetyo et al (2009) utilized spatial models in the

investigation of environmental problems that result from deforestation. In Tasmania, LANDSAT imagery has been used to monitor land clearance (Kirkpatrick 1991). Revegetation by invasive plants is then of particular interest. At Pawnee, north of Colorado, Shaver and Fisse (1973) were able to evaluate vegetation type using photographs. Kirkpatrick and Dickinson (1984) demonstrated how aerial photographs from the 1940's can be useful for mapping vegetation types with the aid of data collated from fieldwork. These latter two publications utilise the combination of image analysis with ground truthing.

Historic artwork and oblique photographs provide evidence of changes of land cover in the years before aerial photographs and satellite data were available. This chapter utilises these sources to focus on the clearance history of three areas in Hobart. These are Knocklofty, Hobart Rivulet and Mount Nelson. The specific aim of the chapter is to identify the location and approximate date of clearance of land for agricultural and urban purposes in the City of Hobart[12].

5.2 Study Areas

There are three major areas with known history of significant modification by human actions, including logging, agriculture, quarrying and urban development (Terry 1999; Bacon et al 2008), and the three areas were selected for analysis. These are the Knocklofty Hills, Hobart Rivulet and Mount Nelson (Figure 5.1). The area of

[12] Map of Hobart's Bushland 2008, online: <http://www.hobartcity.com.au/Publications/Strategies_and_Plans/Bushland_Management_Strategy> .

Knocklofty is located to the west of Hobart. It has long been used for quarrying, as a source of building materials for the city. The second is Hobart Rivulet, which was initially the major supply of fresh water for the city, also where a site for the Female Prison was founded, where cleaning and laundry were undertaken using water from the rivulet. In 1832 the Cascade Brewery, (one of the oldest operating brewery in Tasmania and Australia), was constructed in the valley, also making use of the water supply. A painting of 'Cascade Brewery' produced by Piguinet in 1975 shows that land in the area was used for husbandry. The third area for study is that surrounding Mount Nelson. At this location a Signal Station was erected in 1811, roads were constructed and parcels of lands were cleared for agriculture as well as to increase the visibility of signals.

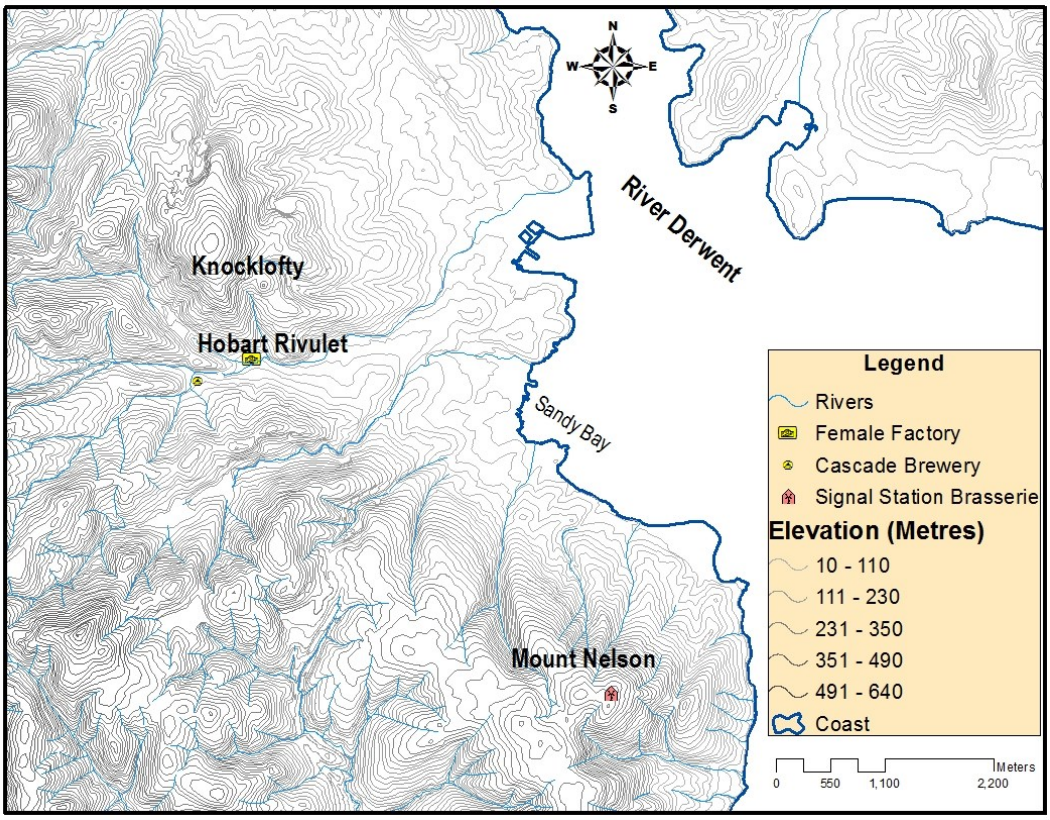

Figure 5.1: Three areas investigated for land clearance with historical sites included**.**

5.3 Materials and Method

Nineteenth images covering the three areas of interest were selected from the database of artworks. The selected images covered the areas of immediate interest, and using the methods of geometrical analysis described in Chapter 2 were assessed as having a high degree of accuracy. Identification of areas of cleared land required extraction of spatial properties. To accomplish such task require extraction of the boundaries of cleared land, utilizing edit tools provided in GIS. In Chapter 4, having demonstrated the utility of spatial analysis techniques for gaining historical geographic insights from paintings, in this chapter contemporary photographs are used to fill gaps in the artworks (Table 5.1). Four historical aerial photographs from

1948 and 1950 were used to identify changes in land use and were compared to the contemporary vegetation cover of Hobart to identify reinvasion. Data for contemporary bushland (BL) provided online by Hobart City Council (HCC)[13]. Categories of data are: (a) bushland within Hobart City Council, (b) Hobart City Council bushland, (c) State and Federal government owned bushland, and (d) Private owned bushland.

In using information from paintings, which have an oblique perspective, identification of visible areas in plan perspective is important. ArcMap offers spatial analysis tools to model visible areas from a point data or line on the surface of a topographic map. For example, Maichak and Schuler (2004), calculated the area visible from census routes to estimate wildlife populations, while Lee (1991), was able to determine best points for observation towers. Procedure involve using a point defined on the surface examined in a three dimension surface of Digital Elevation Model (DEM). Within ArcMap, spatial analyst tools provide computation of what is visible on the surface form a particular location (Alphan and Sönmez 2014, p. 222). Viewshed that is used to define, on raster surface, areas that are visible to one or a set of observer feature. DEM of Hobart, was provided by Land Information System Tasmania[14]. The tool was used to analyse each image, and to indicate the visible areas as seen from the location used by the artist. For example, from location where

[13]http://www.hobartcity.com.au/Publications/Strategies_and_Plans/Bushland_Management_Strategy
[14] http://maps.thelist.tas.gov.au/listmap/app/list/map

Lycett produced a picture “Mt Nelson, near Hobart Town, from near Mulgrave Battery” the visible areas is shaded in green and is shown in Figure 5.2.

Table 5.1: List of selected paintings and photographs.

No	Artist/source	Year	Study area	Type
1	Evans WG	1820	Knocklofty	Painting
2	Earle A.	1825	“	“
3	Frankland G	1827	“	“
4	Chapman TE	1841	“	“
5	“	1848	“	“
6	Mansfield WJ	1844	“	Drawing
7	Bull K	1854	“	Painting
8	“	1855	“	“
9	Gritten H	1856	“	“
10	Chapman TE	1859	“	“
11	Eugene VG	1866	“	“
12	Forrest H	1883	“	“
13	Fleury JL	1894	“	“
14	Unknown	1875	“	Photograph
15	Winter A	1890	“	“
16	Murray AS	1899	“	Painting
17	Aerial photo	1946	“	Aerial Photo
18	Aerial Photo	“	“	“
19	Prout JS	1844	Hobart Rivulet	Painting
20	Piguenit CW	1875	“	“
21	Evans WG	1819	Mt Nelson	Painting
22	Lycett J	1825	“	“
23	Mansfield WJ	1844	“	Drawing
24	Photograph	1873	“	Photograph
25	“	1885	“	“
26	Aerial Photo-1	1946	“	Aerial Photo
27	Aerial Photo-2	“	“	“

As vegetation boundaries are not well defined in the real world, their delineation is not a clear cut task (Harrison 1991; Lindenmayer and Burgman, 2005, p 262). For example, dense forest occasionally intercepts the view of other type of vegetation (Harries 1951). In the study of land-cover classification, the shadow of an object recognized from aerial photograph can be used to determine the size of a tree (Kellner et al 2012).

In Tasmania, many land boundaries have not changed over the years. In the instances where obstructions such as tree cover are partially obscuring a boundary then modern imagery can be used for delineation. However, where boundaries exist beyond the view point of the artist, such as on the opposite side of a hill then such interpolation is not possible and the extent of the visible region of clearance is used without the full area being defined.

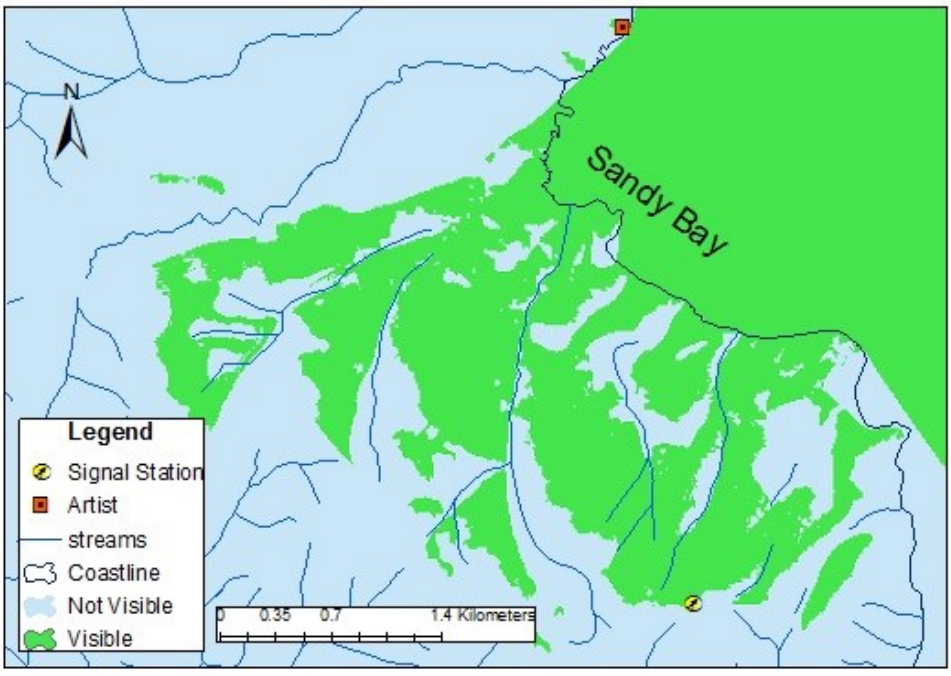

Figure 5.2: Areas visible (green) from an observer point, the artist represented as a red square.

5.4 Geometrical Data Extraction

Defining the tree line, as representation of boundaries of land clearance initially involved measurement from the paintings and geo-referencing using an enhancement to the geometric analysis detailed in Chapter 2. Such areas were also identified on the aerial photographs of 1948 and digitized in ArcMap application.

In chapter 2 the dimensions of the painting were used to determine geometry of the artwork. For example, in the painting by Frankland of 1827 which showing Knocklofty, points in the real world positioned at 12 sites (Figure 2.6), from which the geometric parameters of the painting were determined (Table 2.1). Now the tree line is now defined within the coordinated image by taking measurements of the tree line using an x, y coordinate system originating at the painting centre for *n* discrete points as pairs (x_1, y_1) (x_2, y_2) … (x_i, y_i) …… (x_n, y_n) as shown in Figure 5.3.

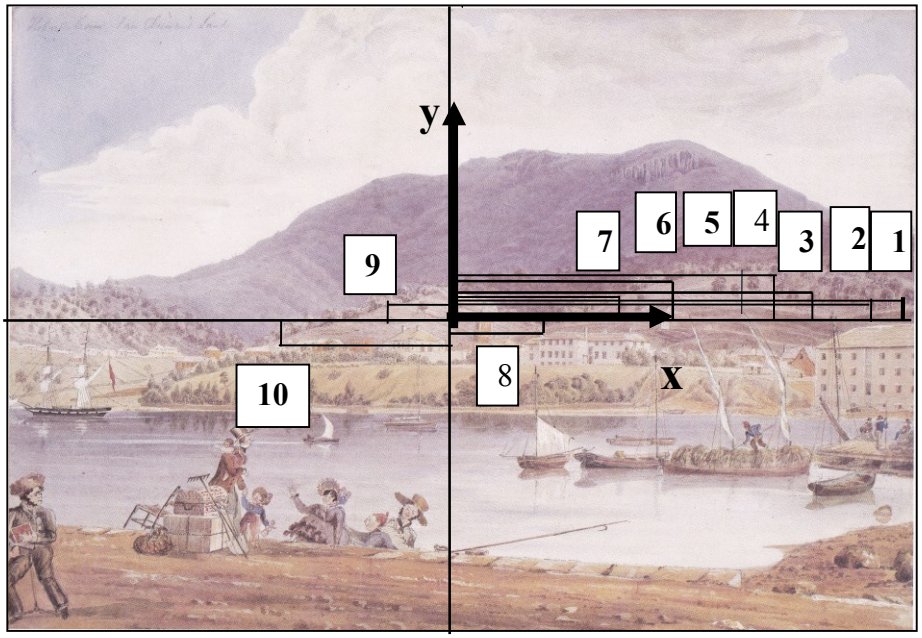

Figure 5.3: Points for geo-reference for defining line of land clearance.

According to the geometry, the direction of the (i), point (ϕ_i) is related to the direction of view (ϕ) and horizontal focal length (f) by:

$$\varphi_i = \varphi + \frac{x_i}{f}$$

A comparison of the extension of this line in the vertical plane with the profile of the terrain then enables the height and location of the tree line to be determined. From the vertical geometry (in Chapter 2, Figure 2.4), with the angle from the horizontal approximated using the vertical measurement from the painting (y_i), the vertical focal length (f) and the elevation of view (ψ) are:

$$\psi = \vartheta + \tan^{-1}\left(\frac{y_i}{f}\right)$$

At a distance (d) from the position of the artist the height in the real world (h) of this ray is extend with distance from the Artist according to:

$$h = U + d\tan\psi$$

Comparing this ray with the profile extracted from a Digital Elevation Model (DEM) of the area enables the distance to the tree line to be determined by intersection. For example, from the Artist location on a contour map, plotting the directions of points on the tree-line as displayed in Figure 5.4.

Extending the rays of the points on the tree line which extracted from the painting to the length of the profiles and superimposing these lines on the profiles that created from the terrain model, gives the point of intersection (P_i) two diagrams shown for example (Figures 5.5 and 5.6).

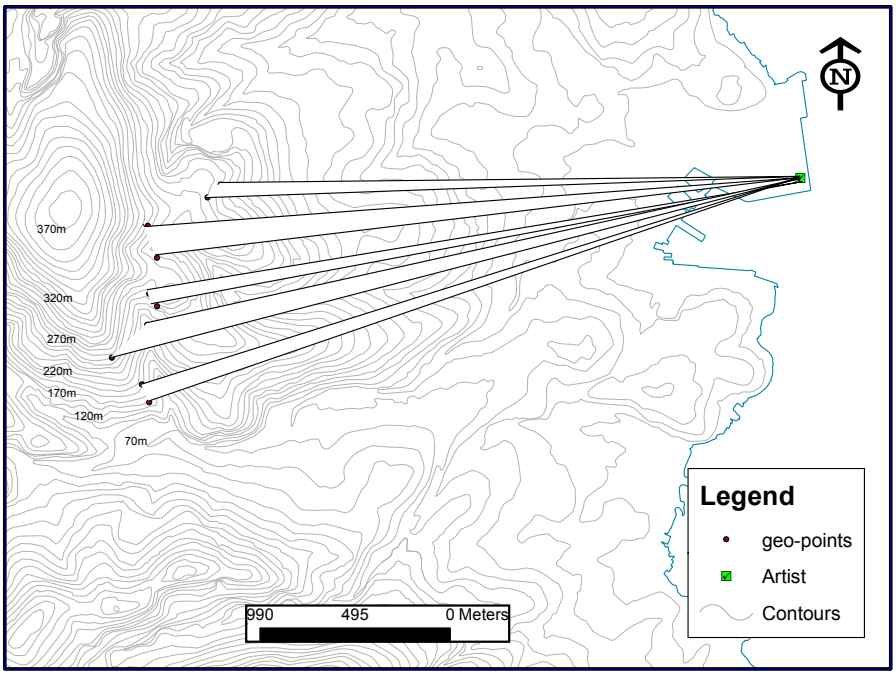

Figure 5.4: Mapping distances between points of trees to artist location displayed over contour layer.

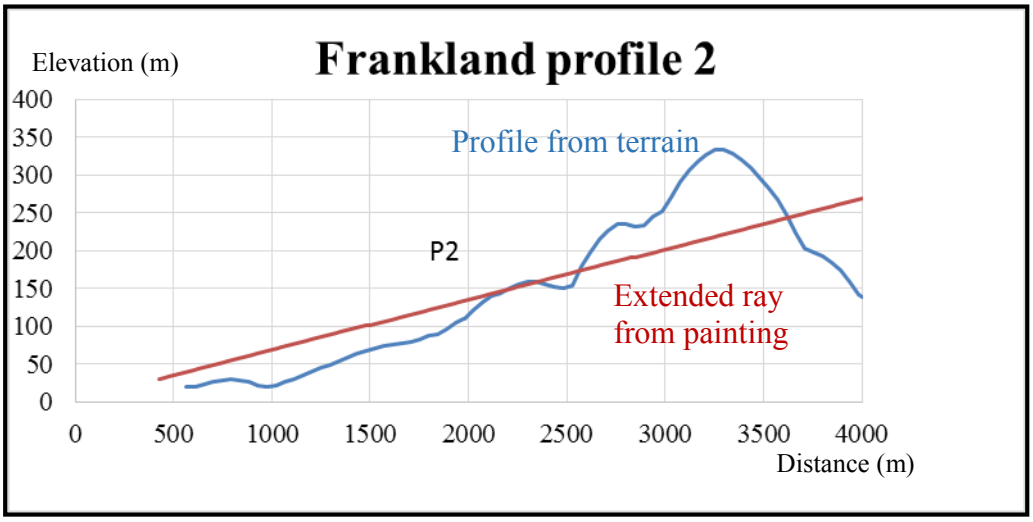

Figure 5.5: Diagram of profile 2 for the tree line.

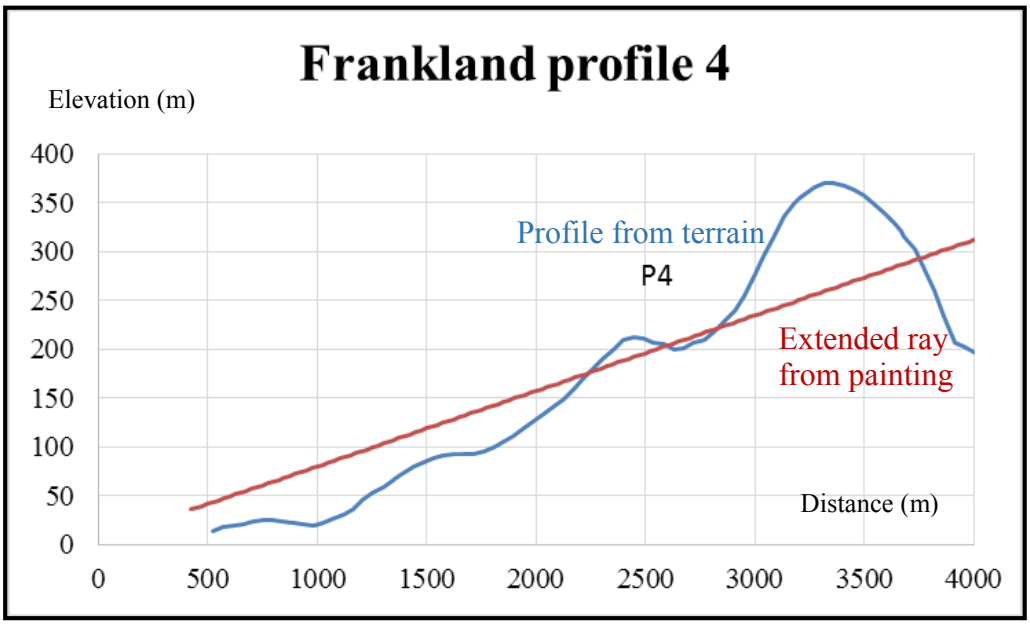

Figure 5.6: Diagram of profile 4 for the tree line.

The height of the tree line (*H*) at the point is read from the vertical axis, and distance from the artist to the tree line (*D*) from the horizontal. With the distance and bearing available the position of the point can be determined using:

$$x_i = X + D_i \sin\varphi$$
$$y_i = Y + D_i \cos\varphi$$

Where X, Y is the location of the Artist in east and north. Results displaying horizontal locations and heights to which trees are cleared for the ten points displayed in table 5.2.

Results obtained from points along the tree line are tabulated and plotted in GIS. Points are then connected to show the approximate tree line on the Eastern side of Knocklofty in 1827 from the painting by Frankland (Figure 5.7). There is some uncertainty over what happens in the valley to the south, which is partially obscured by a hill, but the painting clearly indicates trees within the valley.

Table 5.2: Data of points represented by East and West (X,Y) for defining line of cleared land (GDA_1994_MGA_Zone_55).

Point	Distance	East	North	Elevation
1	2480	524844	5252219	190
2	2150	524742	5252163	210
3	2760	524577	5252036	250
4	2825	524496	5251857	222
5	2780	524594	5251792	215
6	2855	524552	5251634	212
7	3060	524376	5251498	170
8	3090	524478	5251118	220
9	3118	524357	5251363	140
10	3060	524468	5251221	120

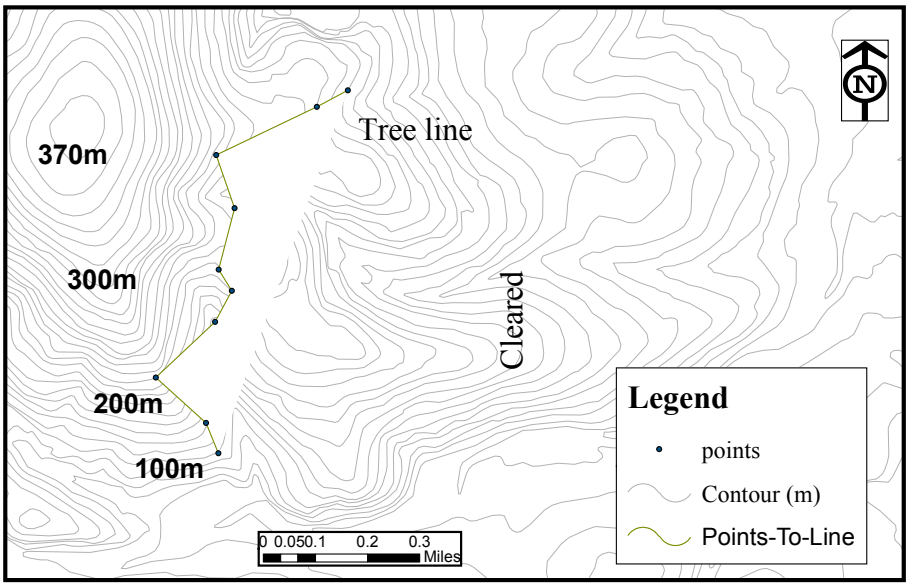

Figure 5.7: Tree line (of 1827) overlay contour layer.

This procedure was applied to an 1841 painting by Chapman (Figure 5.8) also covering the region of Knocklofty. Resulting treelines for 1827 and 1841 provided on the contour map in Figure 5.9 shows considerable inconsistency.

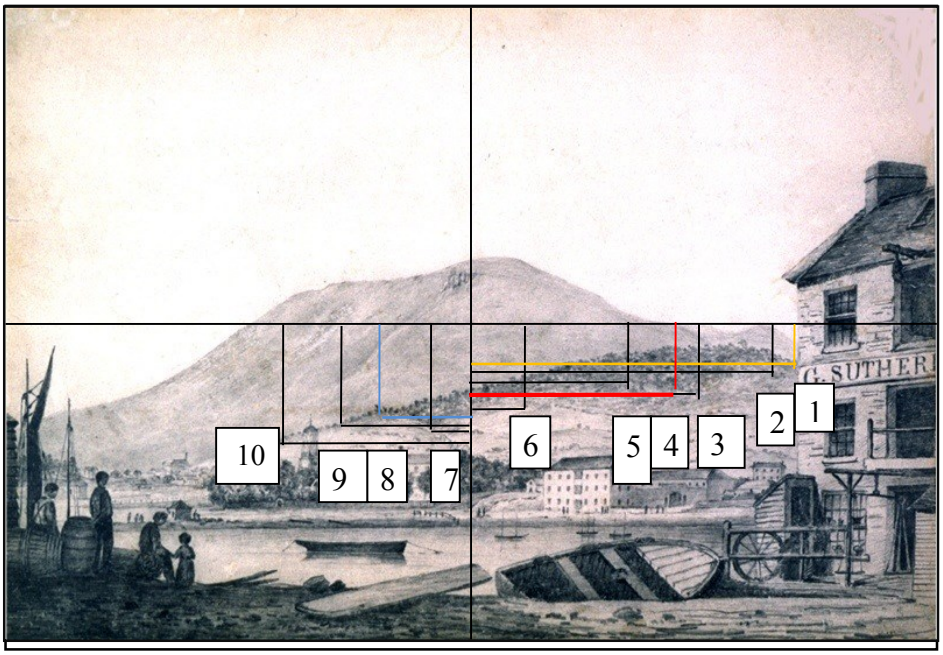

Figure 5.8: Points for geo-reference of drawing "*From Old Wharf*" by Chapman, 1841, (24cm x 36cm).

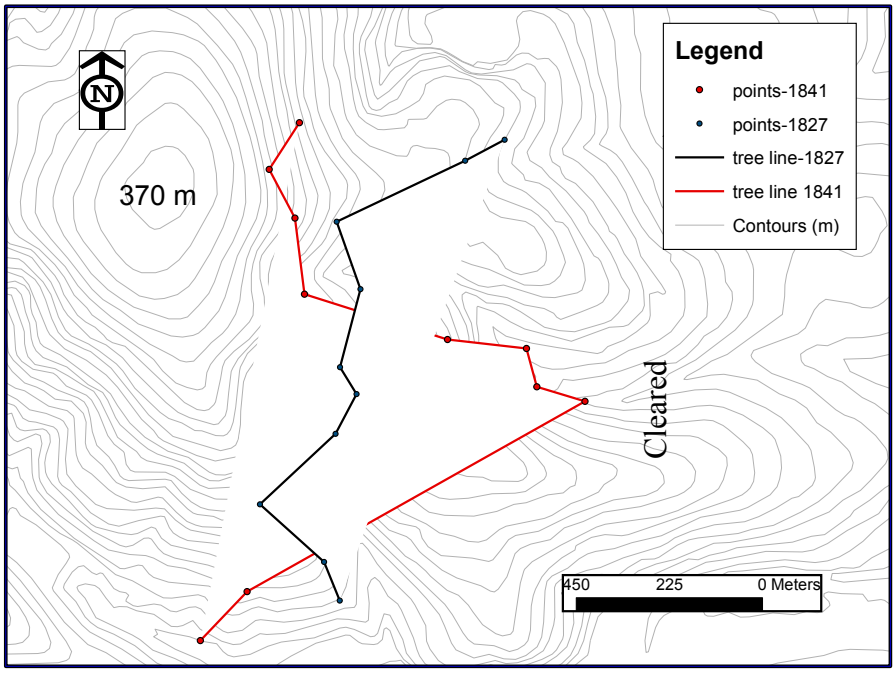

Figure 5.9: Tree line of 1827 (black) and 1841 (red) placed on the contour lines in metres.

In the Cascade valley a picture by Piguenit of 1875 was used to identify the tree line (Figure 5.10). From visual inspection of the image it is apparent that deforestation did not take place to the same extent as it did on Knocklofty. Coordinates of points used to georeferenced the image are shown with cleared land outlined in yellow. Only some of the cleared areas are visible in the image with the remainder obscured from view by hills in the foreground. Details of points used to georeference the image are provided in Table 5.3, rays taken to the visible extremities of land clearance were then superimposed on profiles from the contour map to determine the extent of land clearance with the resulting visible boundaries shown in Figure 5.11.

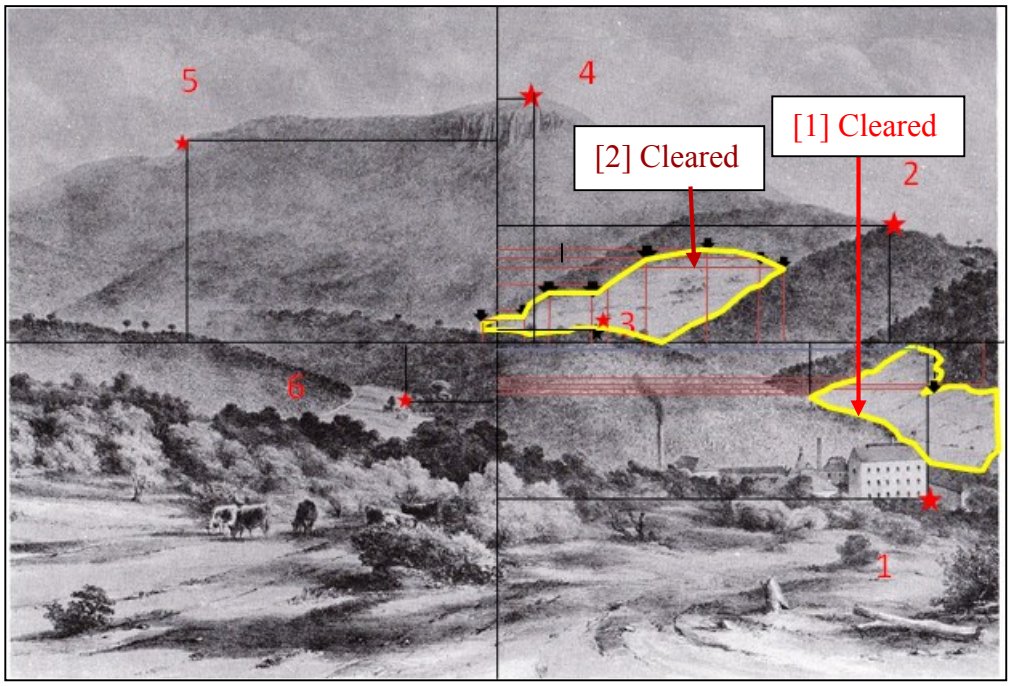

Figure 5.10: Points of topographic features used for defining coordinate for the image, by Piguenit "*Mt Wellington Hobart Town*" (44 cm x 65cm).

Table 5.3: Points defining six selected topographic features defined in Figure 5.9 (GDA_1994_MGA_Zone_55).

No.	X	Y	Elevation
1	523915	5250735	102
2	522212	5249905	250
3	523629	5250655	144
4	522370	5251296	330
5	521974	5250634	240
6	523603	5250488	119

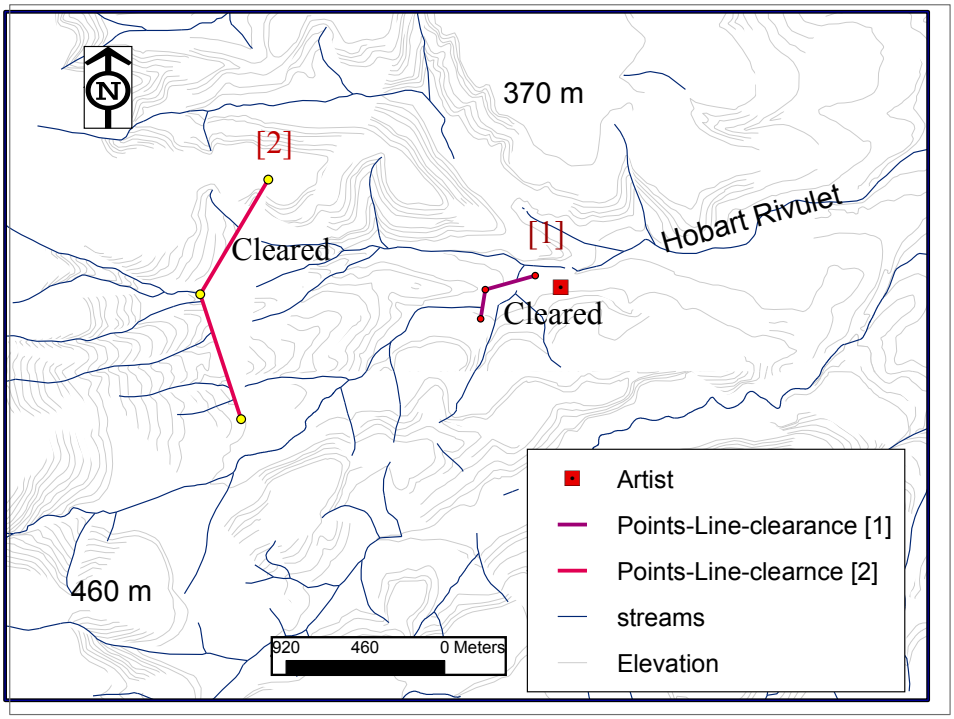

Figure 5.11: Two lines connecting points derived from the geometric method on the Piguenit Lithograph give unrealistic location of cleared land.

5.5 Suitability of Application of Geometric Method

Paintings produced by both, Frankland and Chapman, are from a similar location and of a similar scene. The resulting tree line for cleared land at Knocklofty was extracted to compare boundaries on the hill in 1827 with that of 1841 and placed on

the contour map to show the changes that took place in less than two decades (Figure 5.9). There was some difficulty encountered with geo-referencing of the Chapman image, which has some distortion when compared to perception from viewing the painting.

While the process of extraction through measurement from paintings is geometrically correct, small distortions in images can be extended across several kilometres of line of sight to misplace points in the real world both horizontally and vertically. For example, if there is a 1 mm error in the location of a point in the painting in comparison with the determined geometric parameters for that painting, at a focal length of 1 m (typical of that found in Table 2.1), at the centre of the painting this will extend to 1 m at 1km, 2 m at 2 km and so on. Residual values of up to 8 mm were determined in the vertical component were found in paintings, offering an apparently insignificant error of 16 m in the real world over a typical distance of 2 km (Figures 5.5 and 5.6). However, as shown in Figures 5.5 and 5.6, this inclined ray is intersecting with a similarly inclined terrain, so the point of intersection is moved a considerable distance. An error in elevation of 16 m would result in a horizontal distance error of 200 m (10% of the distance in the example) if the ray and terrain intersect at an angle of 5 degrees. This problem was observed with the results shown in Figure 5.11, which places the lines of cleared land across the valley rather than on the hillside to the North side of the valley. An alternative approach that allows such errors to be reduced was therefore required. This method involved more interactive means of comparison of the image with a modern digital perspective view.

5.6 Painting Into GIS

Relating a painting to the real world for georeferencing within a GIS application involved identification of a number of topographic features with the visible areas included for verification (Figure 5.12). Delineation of boundaries of cleared land may be accomplished through identification of their location on the digital map.

Within the painting, the area identified as cleared land is manually drawn from the image, using edits tools, the shape is copied and transformed to the base map in ArcMap (Figure 5.13). The shape is adjusted using referenced points, stretched in different directions such that the control points from the image are aligned with those on the map, a technique known as rubber-sheeting. This was aided through the use Observer Point (same as Viewshed) modelling in GIS, using the location of the artist as observer point which display a layer of areas that can be seen from that particular location. The surface that visible to the artist is used to refine the rubber sheeting in the area to place the shape of the cleared area at the correct location.

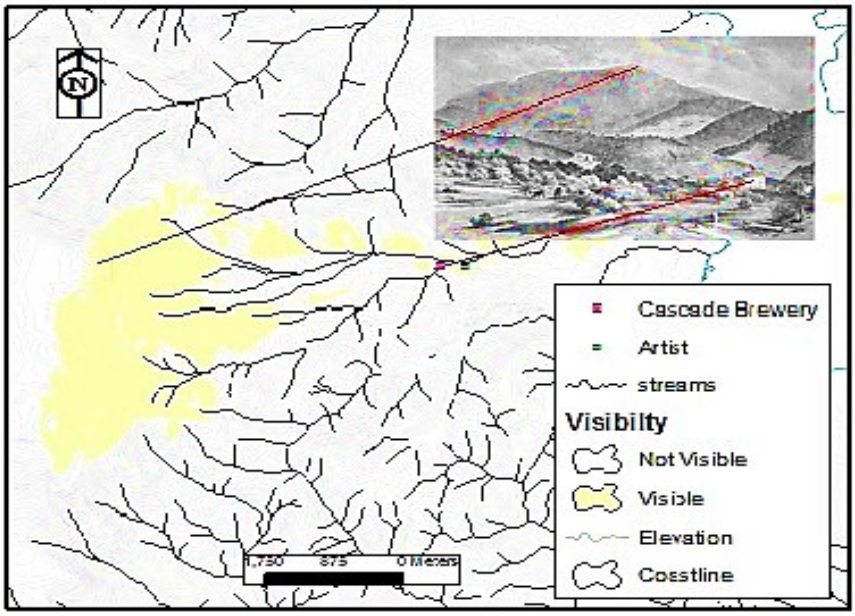

Figure 5.12: Two geographic features relate picture to GIS, visible areas shown in yellow.

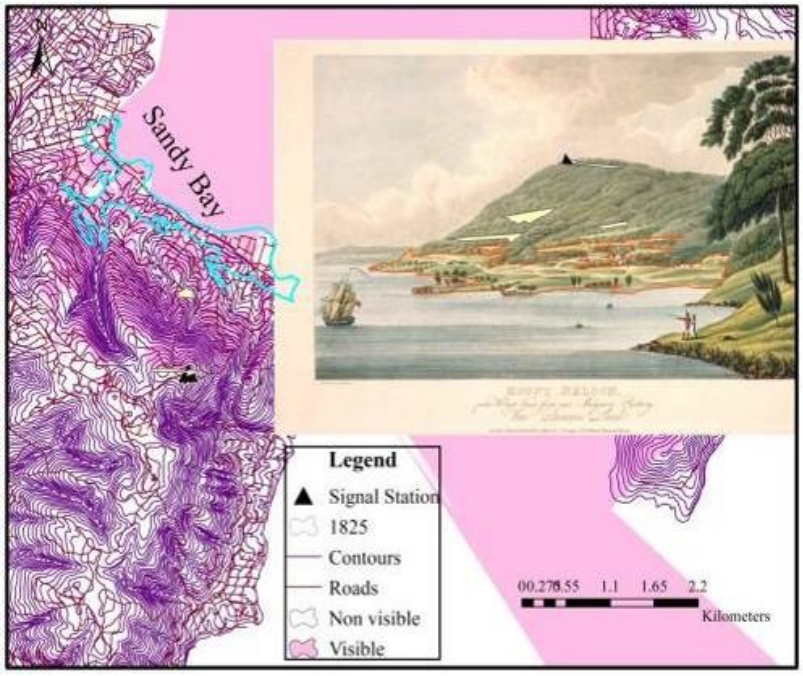

Figure 5.13: Digitized boundaries of cleared land integrated in ArcMap (water colour painting by Lycett entitled "*Mount Nelson*").

5.7 Integration of Aerial Photo and Correction

In referencing of an aerial photograph the selected points should be features in the area of temporal constancy and spatial spread (Hughes, McDowell and Marcus, 2006). Distortion occurs due to terrain and camera tilt (Stone 1998). GIS offers rectification through redundancy in control points across the image. It is important to identify landmarks, such as streets and bend of rivers, clearly visible in the image, to select the suitable layers from the base-map. Digital map with layers of rivers, roads and land outline layers provided by DPIPWE[15], were used to define coordinates of features defined (Figure 5.14).

Aerial photographs in jpg format were imported into ArcMap. The geo-reference tools were applied to fit and display image, rotated and scaled. Then, key points such as a bent on road, intersection, and corners of buildings that identifiable from image were used to connect image to map. More than 20 points were selected. The task involved a thematic layer of roads overlay and buildings that still exist, such as, Cascade Brewery and the Female Factory were used. These points allow image to be connected to the geo-referenced map of Tasmania (Figure 5.15).

[15] Shape files in GIS format were obtained from the Department of Primary Industry, Parks, Waters and Environment of the Government of Tasmania.

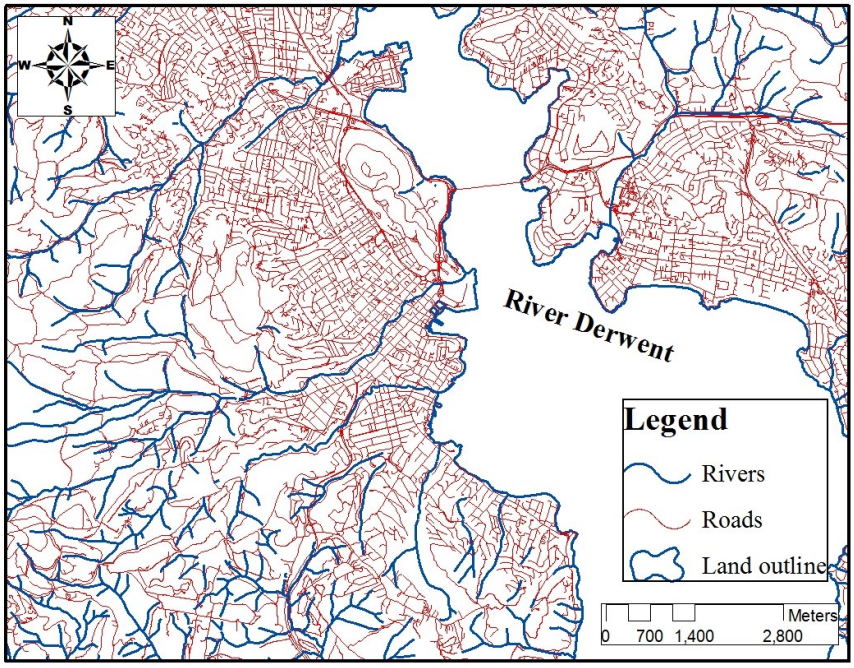

Figure 5.14: Thematic layers used for geo-reference (GDA 1994 MGA Zone 55).

Orthorectification or correction of each image (e.g. tilt, skew, light) involved enhancement to improve visibility by variation of contrast to 20%. Display quality was modified to medium mode to allow a clearer view of elements.

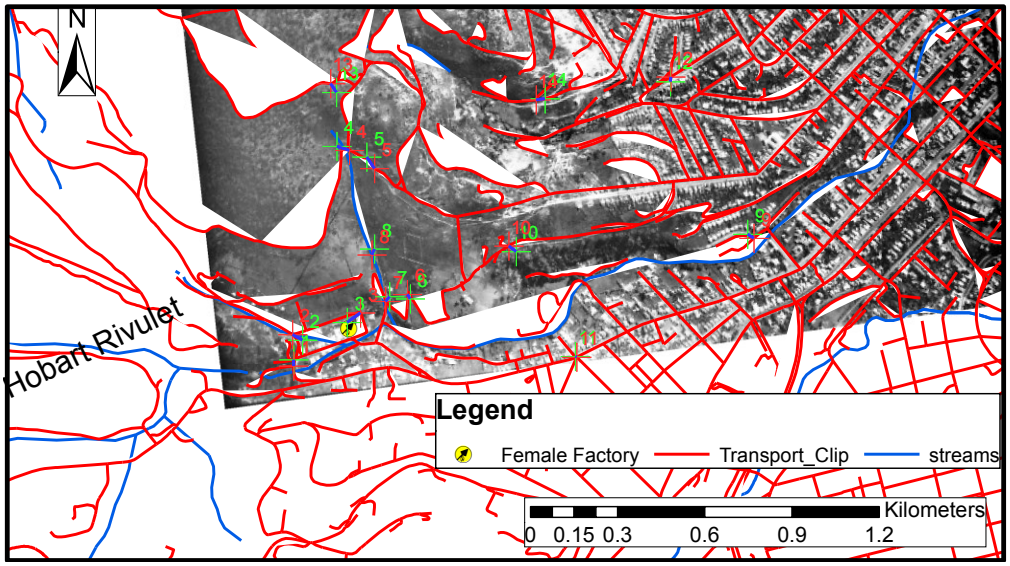

Figure 5.15: Hobart road layer used to orthorectify aerial photographs.

5.8 Land clearance assessment using GIS

GIS was also used to assess the progress of land clearance through the settlement period and more recent re-vegetation. Areas or tree lines delimiting land clearance as shown in paintings and photographs of the 19th century were georeferenced using techniques described in sections 5.6 and 5.7 respectively. Each image was displayed and boundaries of the cleared land were digitized and encoded as separate layers. Resulting lines and areas were organised chronologically. Multiple layers of the selected areas were displayed to delineate features in GIS representing cleared land of the 19th century and was compared with the boundaries of the mid-20th century. Through examination of features represented the areas and in chorological order, the changes that took place in the vegetation at selected areas in the region of Hobart can be measured**.**

5.9 Results and Discussion

Sections 5.9.1, 5.9.2, and 5.9.3 present the results and provide a discussion of the spatial analysis of land clearance conducted in Knocklofty, Hobart Rivulet and Mount Nelson, respectively.

5.9.1 Clearance on Knocklofty

By1820 land was cleared from the coast to a variable elevation between 60 and 70 meters (Figure 5.16). Five years later Earle depicted developments over the hills with clearance of land increased to 80 meters (Figure 5.17). Within the decade, Frankland showed roads penetrating the forest at a higher elevation, but there were some scattered trees remaining (Figure 5.18). Generally, clearance avoided the steep lands and is consistent with the findings of Flinn et al (2005). By 1856, activities led to

clearance of land to an elevation of 150 m (Figure 5.19). In a photograph taken from Glebe to the north of Hobart and dated 1857, there is a cleared area located at approximately 220 m in altitude (Figure 5.20). Little change occurred by 1866 (Figure 5.21). By 1883, boundaries had reduced to 180 m in elevation (Figure 5.22), which indicate regrowth of trees. However, by 1894, clearance was back up to 200 m (Figure 5.23).

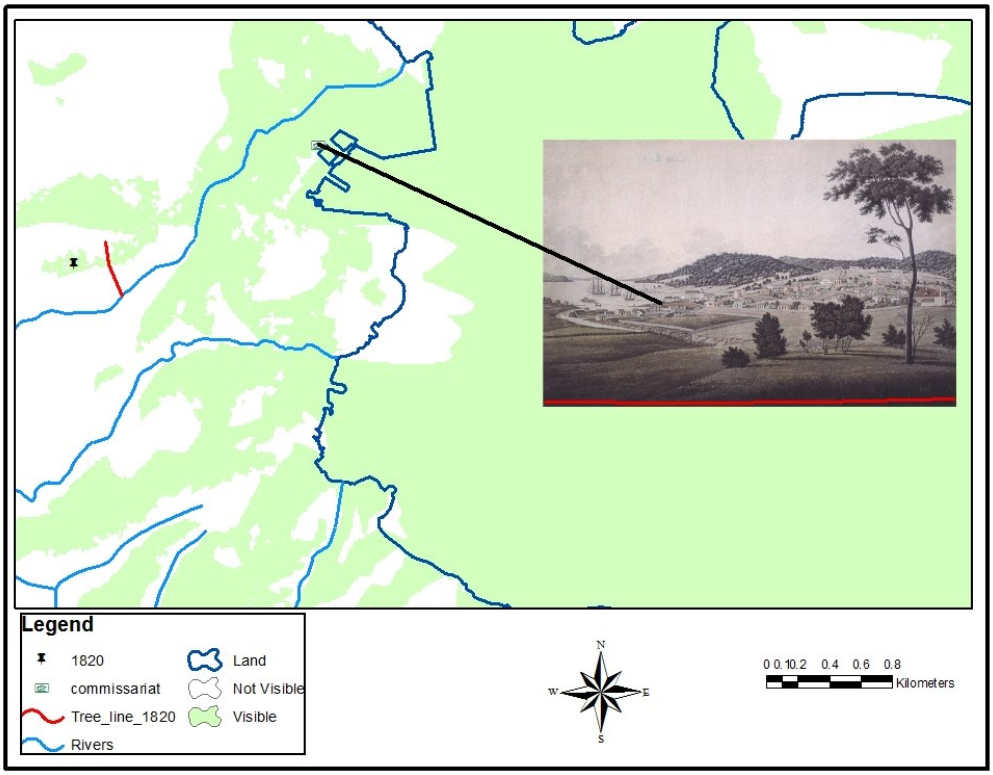

Figure 5.16: Hobart Town (1820), a historical building used to relate picture to map.

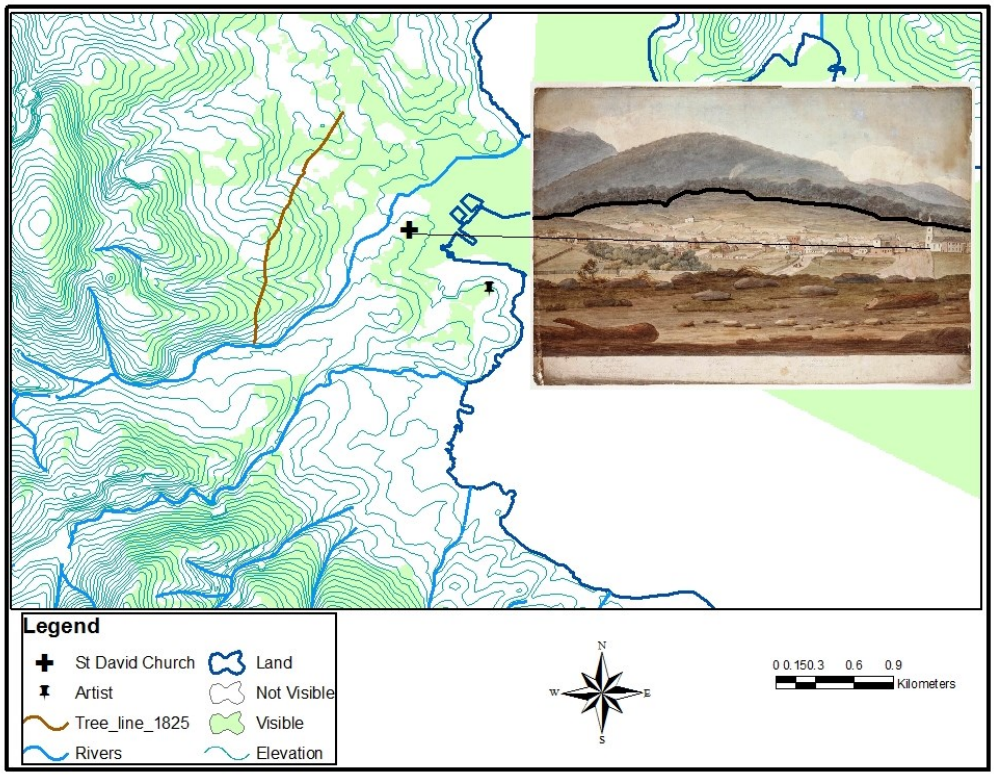

Figure 5.17: Delineation of cleared land using landmarks (Earle, 1825).

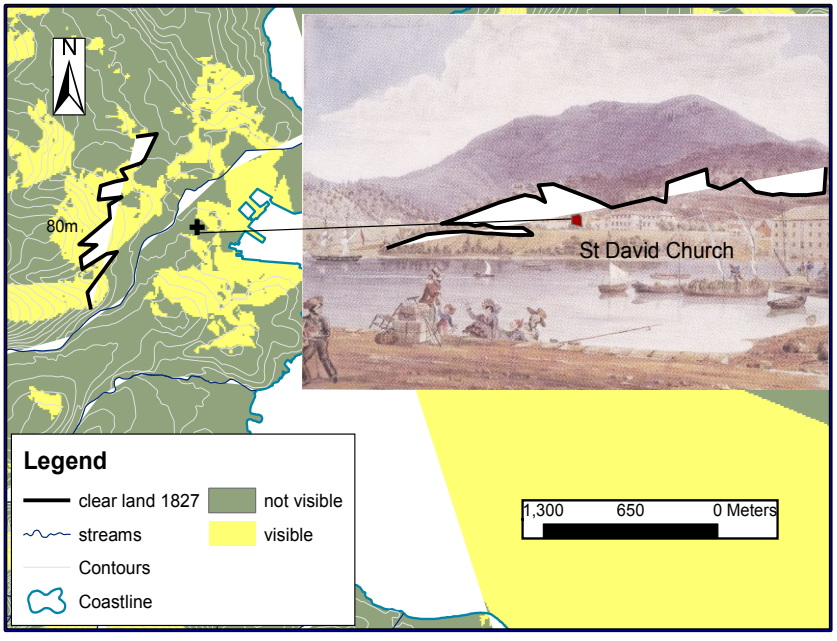

Figure 5.18: Boundaries defined using landmarks (Frankland, 1827).

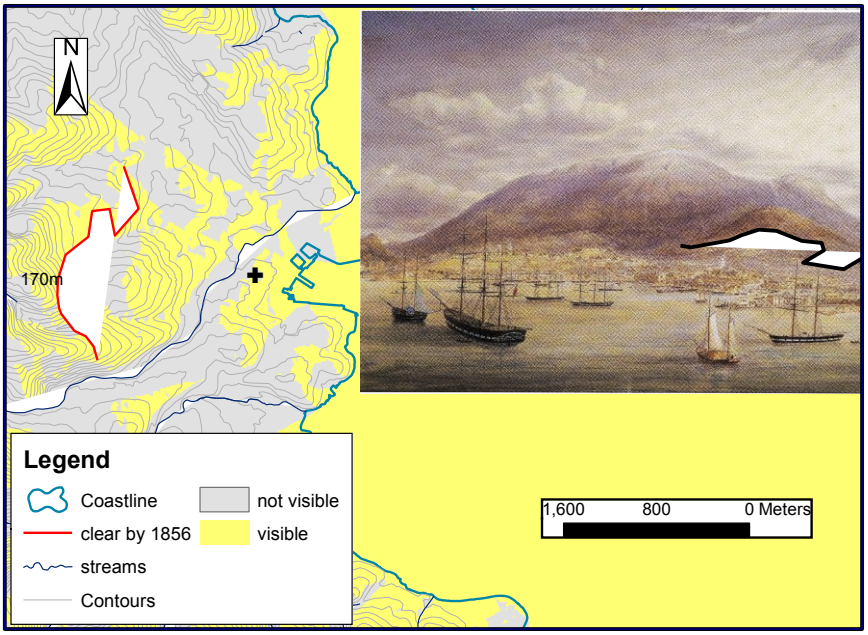

Figure 5.19: Progress of land clearance over the hills (Gritten, 1856).

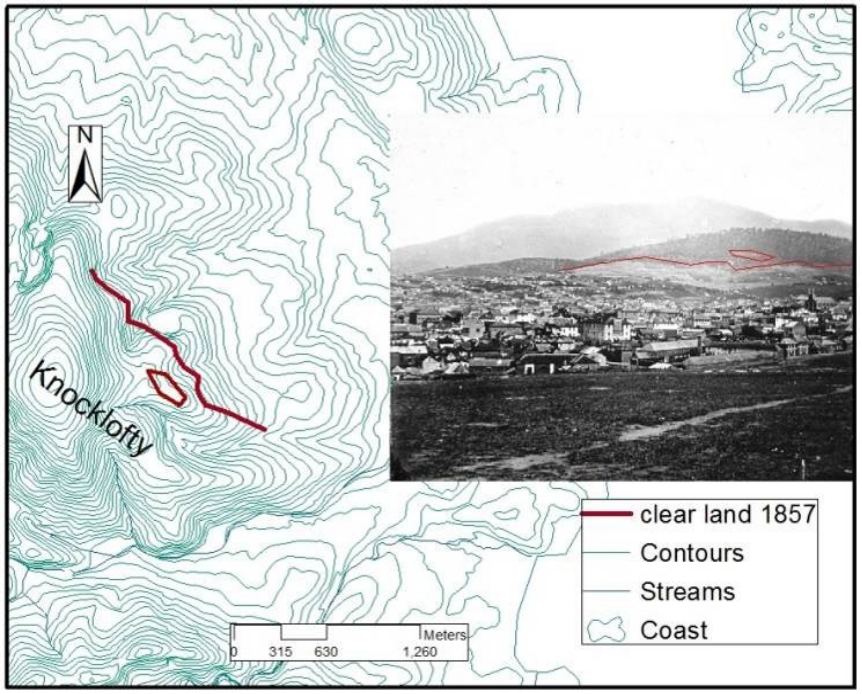

Figure 5.20: Land cleared extended, from photograph by Charles Abbott, (155 x 215mm).

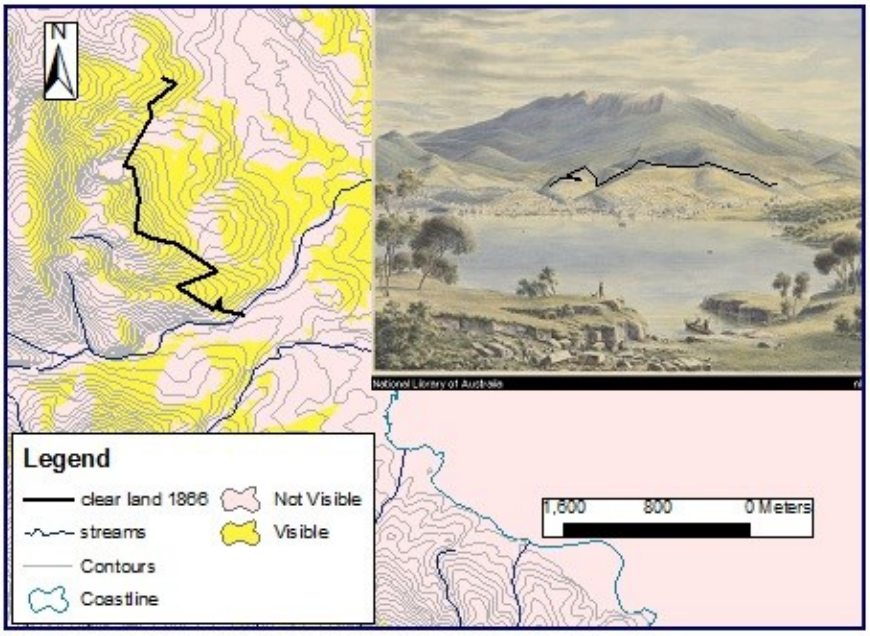

Figure 5.21 The boundaries in 1866 "*Hobart from Kangaroo Point"*, Von Gérard Eugene.

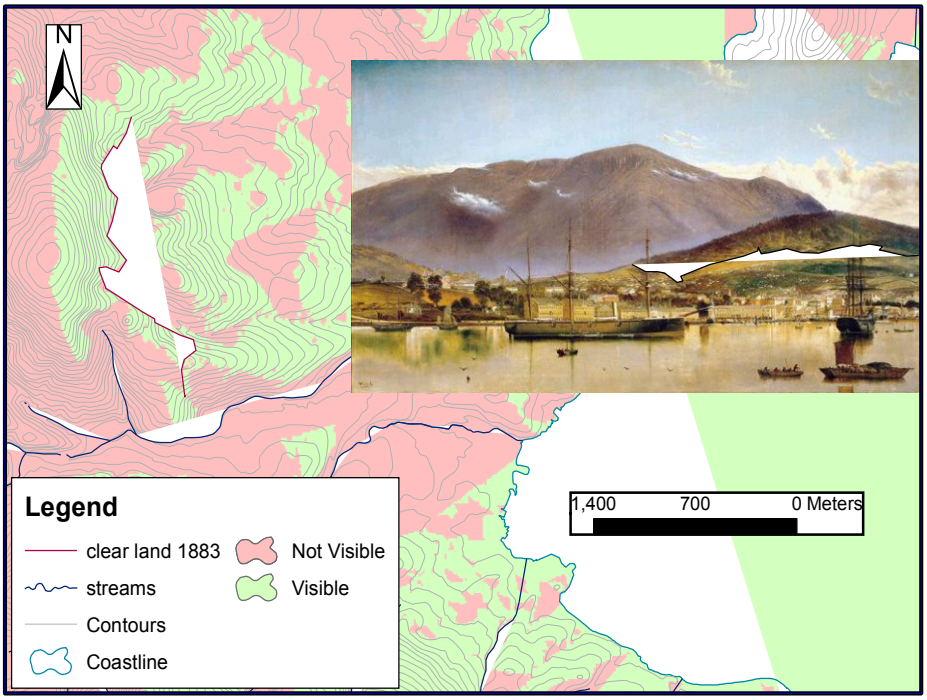

Figure 5.22: Cleared land in 1883 as depicted by H. Forrest, "*Mount Wellington and Hobart*".

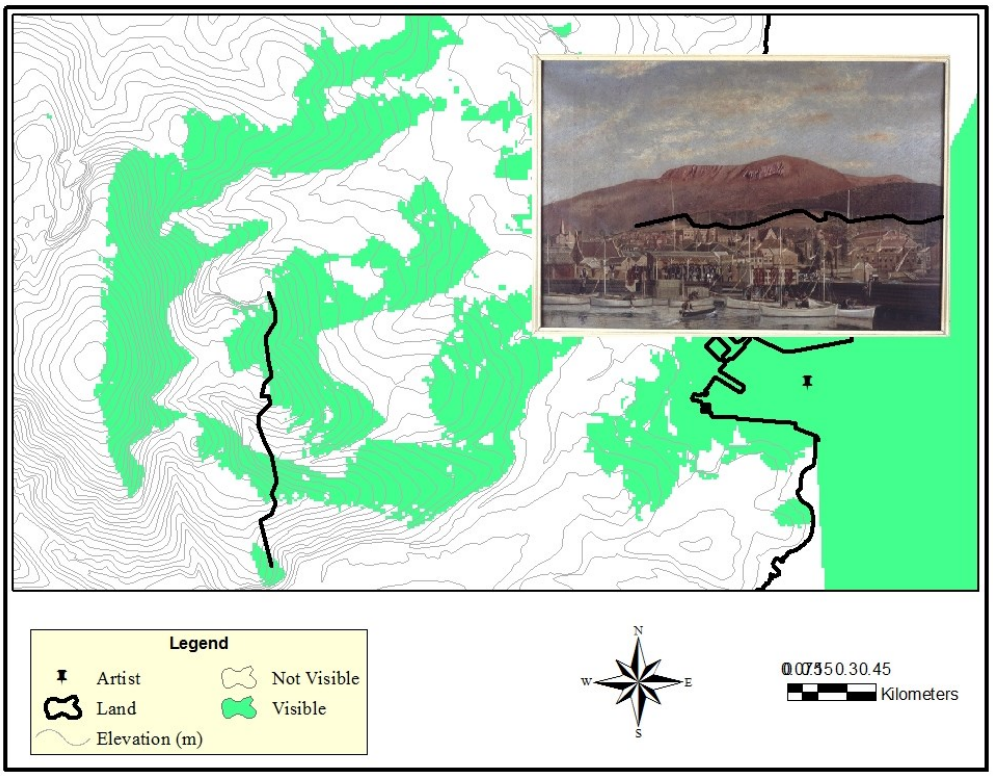

Figure 5.23: Boundaries as depicted by JL. Fleury, " *Fish market Hobart*" 1894.

Analysis of cleared land at Knocklofty was based on boundaries obtained from six images through time, see Table 5.1. In this instance as no data was available from the far side of the hill the boundaries of the tree line are delineated to the east only and shown as a line and not a polygon, hence, land clearance is defined as lines. In this form of representation in the GIS the comparisons through time can only be made visually and areas cannot be calculated. The historical trend is provided in Figure 5.24, where lines are used to shown boundaries of the 19th Century and polygons for bushland of the mid-20th century, as well as data from Hobart Bushland map of 2008, these data were derived from aerial imagery. The tree lines indication of the progress of clearance ot vegetation showed variation. By 1946 some land that was cleared in the 19th century had returned to vegetation and tree cover with bushland extending

further across the area by 2008. Notably, steeply sloping land remained under tree cover throughout, which indicates reliability of data depcited in artworks as well as from photographs.

Terms used as abbreviatioms in the following maps (Figures 5-24 through 5-34) are defined in Table 5.4.

Table 5.4: List of abbreviation used and asociated definitions.

Abbreviation	Description
BL	Bushland
CL	Cleared land
HCC	Hobart City Council
G	Governement
PO	Private Owned

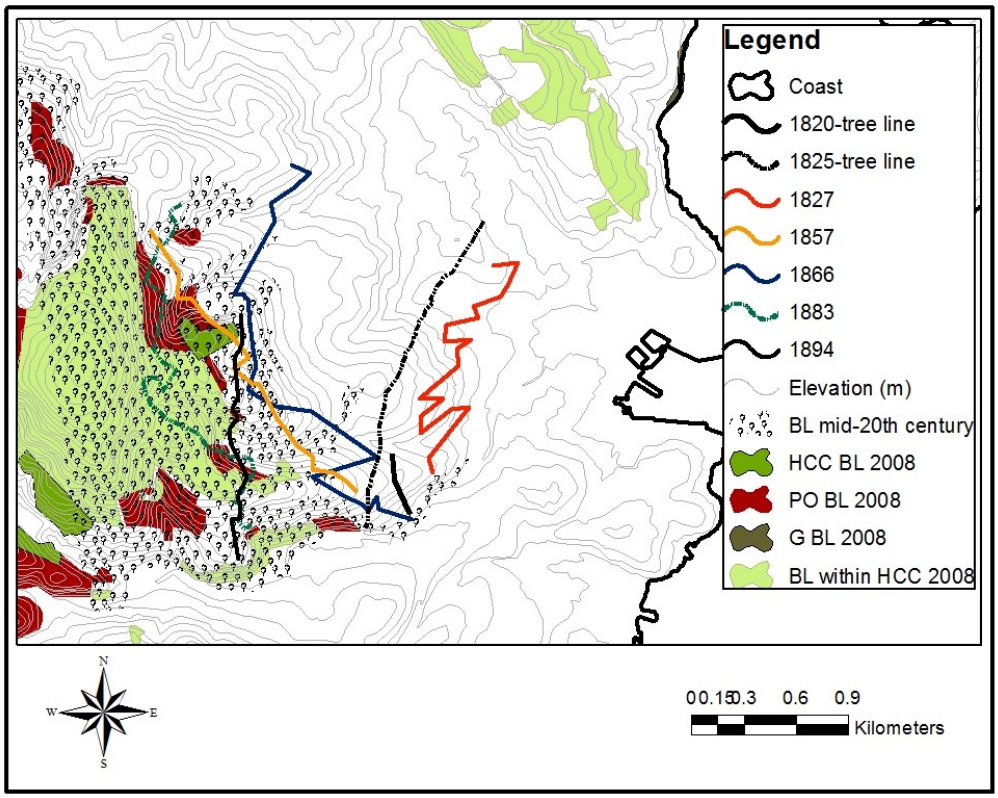

Figure 5.24: Tree lines in the nineteenth century and bushland boundaries in 1946 and 2008.

5.9.2 Clearance at Hobart Rivulet

Along the banks of the Hobart rivulet mudstone and sandstone were exploited from the early years of settlement. In the bottom of the valley, at a distance of 3km from coast, lands were cleared to accommodate a prison for female convicts. In Figure 5.25, a painting by Prout dated 1844 shows that trees were also removed on the surrounding hillsides. Clearance extended westward from Hobart deeper into the Cascade Valley and also further up the valley sides with a depiction by Piguenit dated 1875 showing cleared land over the hill sides. Besides agriculture, anthropogenic influences expanded in the region with opening of Cascade Brewery, where supply of fresh water and suitable land for cultivation of hops were available.

The boundaries of cleared lands as depicted by Piguenit, were digitized and then transformed to the map as shown in Figure 5.26. The terrain depicted in paintings by both Prout and Piguenit can be measured. The paintings cover different areas of the valley. Within GIS the digitized areas of cleared land were calculated using union tool, provided a total area of 241018.4m^2. The total area was extracted from the layer of bushland provided in aerial images of the mid-20th century (Figure 5.27). There limitation of the boundaries from the photographs, as the image did not extend to include the total area depicted by Piguenit. However, when using the layer of bushland of 2008 (Figure 5.28), the computation shows that 71% of cleared land depicted by both artists Prout and Piguenit, had return to bushland.

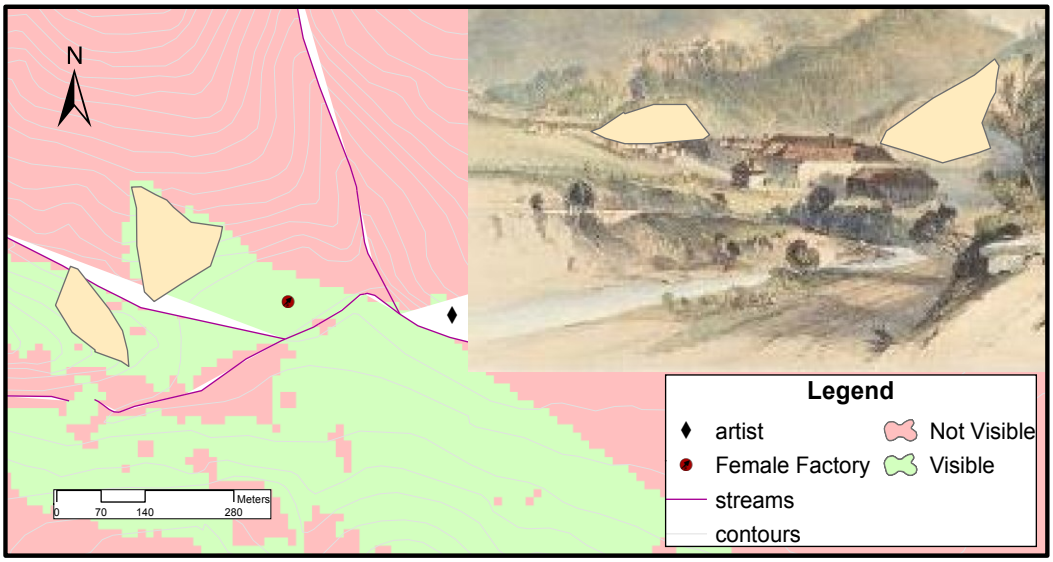

Figure 5.25: Areas of cleared land in 1844 by Prout " The female factory from Proctor's Quarry" .

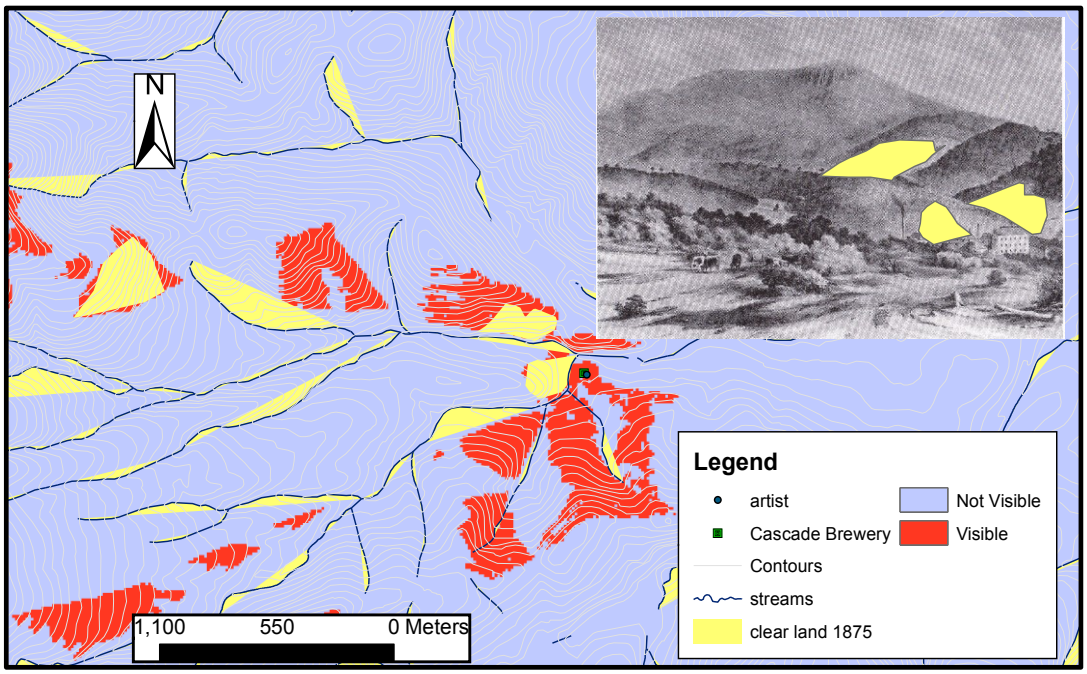

Figure 5.26: Boundaries of clear land over the hills (Piguenit, 1875).

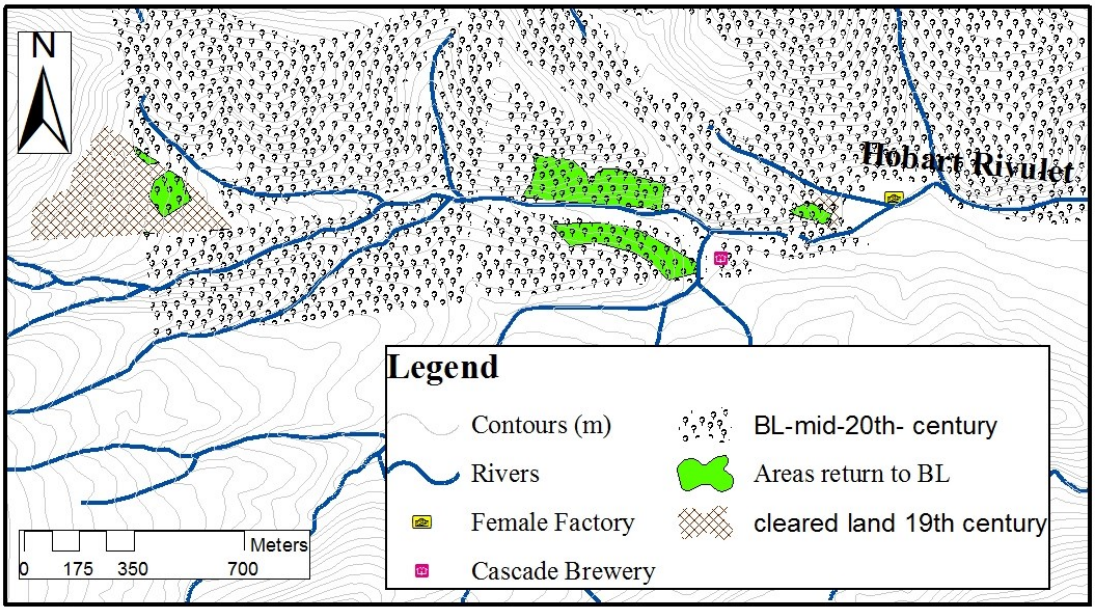

Figure 5.27: Areas (in green) of cleared land returned to bushland (BL) by mid-20th century.

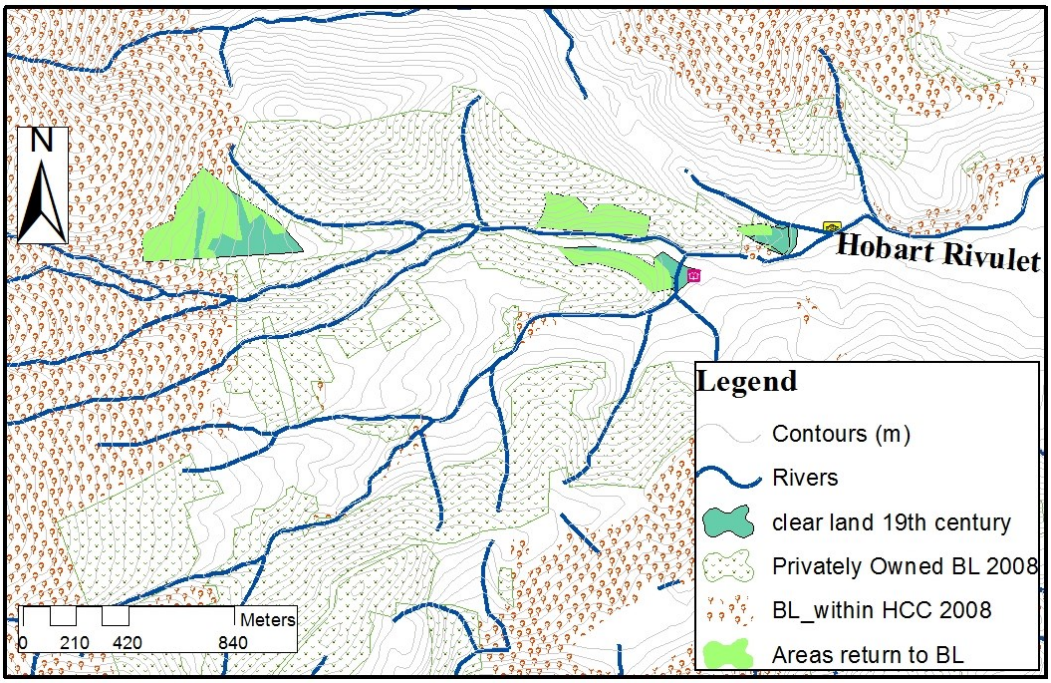

Figure 5.28: By 2008, 71% of the total cleared land of the 19th century under Bushland.

5.9.3 Clearance at Mount Nelson

Mount Nelson was not fully cleared of vegetation. By 1819 activities had led to the general clearance of land to an elevation of 70m on the northern foothills along with small patches up to 140m on the flank (Figure 5.29). An area close to the summit was also cleared to accommodate the signal station thereby offering visibility from the city and to provide a lookout point with a view along the river. By the time Lycett painted Mount Nelson in 1825, land clearance had expanded on the foothills and a swathe had been cut from the Northern flank (Figure 5.30). The cleared area on the summit had also been extended down to an elevation of 1260 m at the lowest point. Clearance on the foothills continued through 1854 (Figure 5.31) and on into

1885, by which time the clearance had expanded upslope with parcels cleared mainly for agricultural use (Figure 5.32).

Layers of cleared land extracted from pictures and photographs were joined using spatial union tool in ArcMap, the resulting layer was clipped from the layer representing bushland of the mid-20th century (Figure 5.33). This procedure was repeated with layers of bushland extracted from the 2008 data (Figure 5.34). There were areas of cleared land that had returned to bushland over time. However, the total area of cleared land on the summit was increased from 54496 m^2 in 1819 to 189545 m^2 by the middle of the century. By 1946 an area of 15327 m^2 at the summit had returned to bushland and by 2008 vegetation had expanded further to cover 42466 m^2 of previously cleared land.

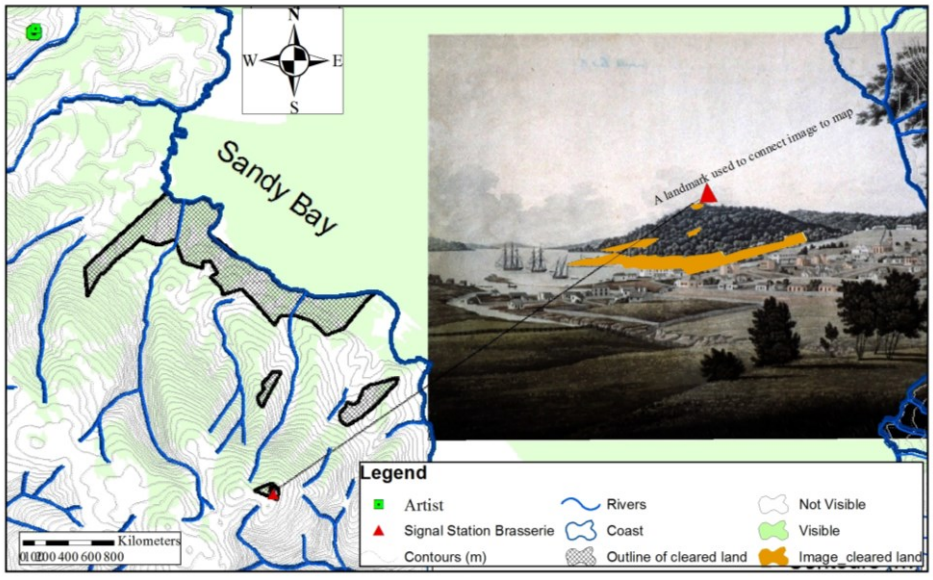

Figure 5.29: Scaling and transforming area of clear land from a painting to map, (Evans "Hobart from West" 1819).

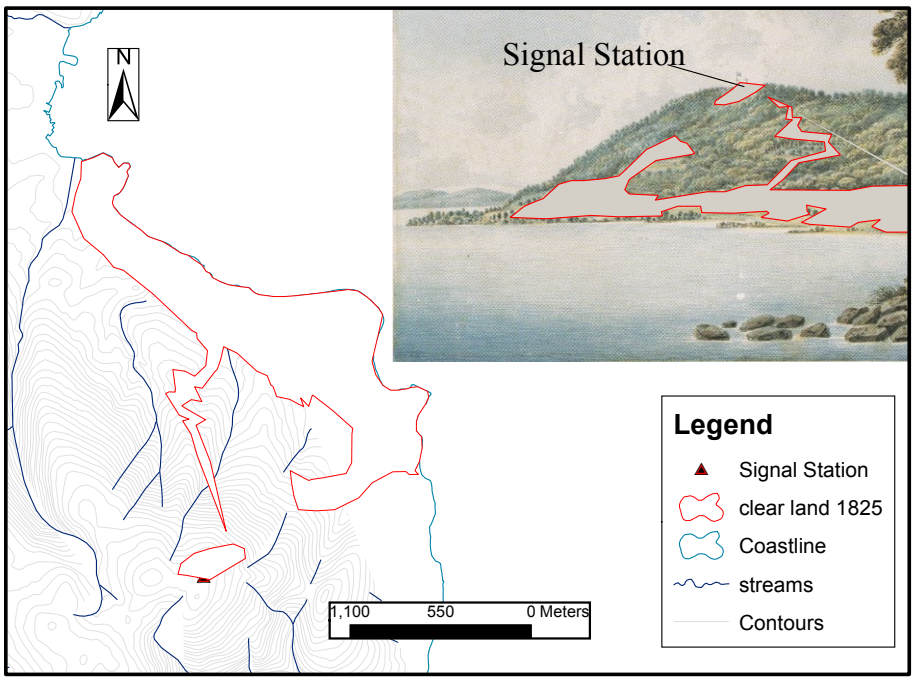

Figure 5.30: Expansion of boundaries, painting by J. Lycett, 'Mt Nelson', 1825.

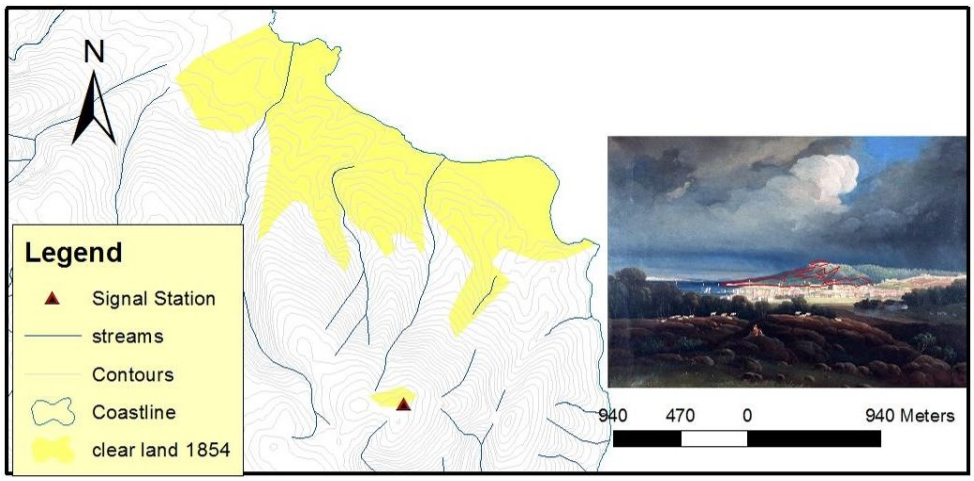

Figure 5.31: Boundaries of cleared land depicted in 1854 by Bull '*Hobart from Domain*'.

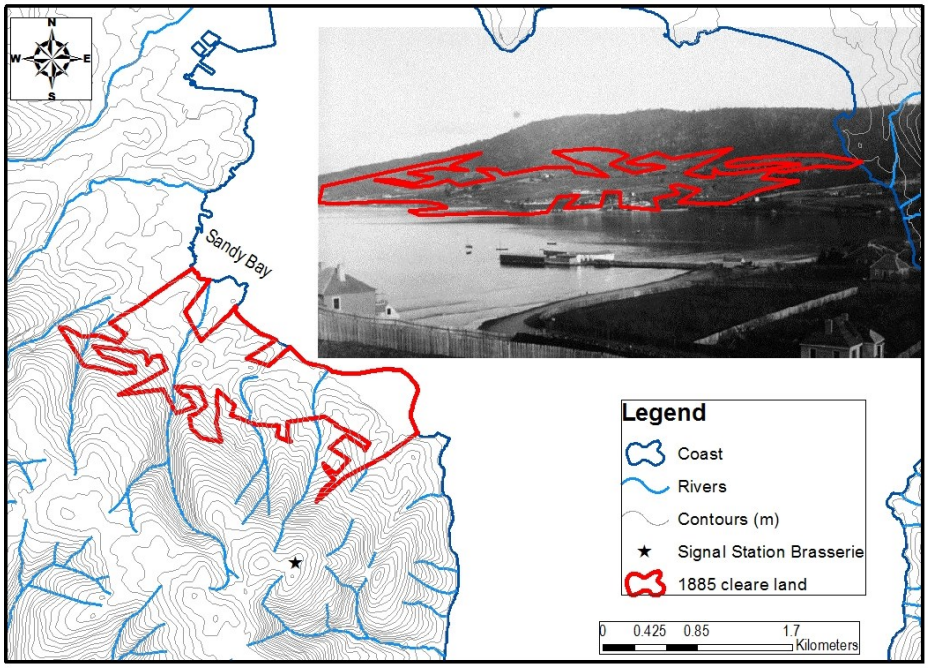

Figure 5.32: Cleared land from a photograph, ca. 1885 (175 x 209 mm).

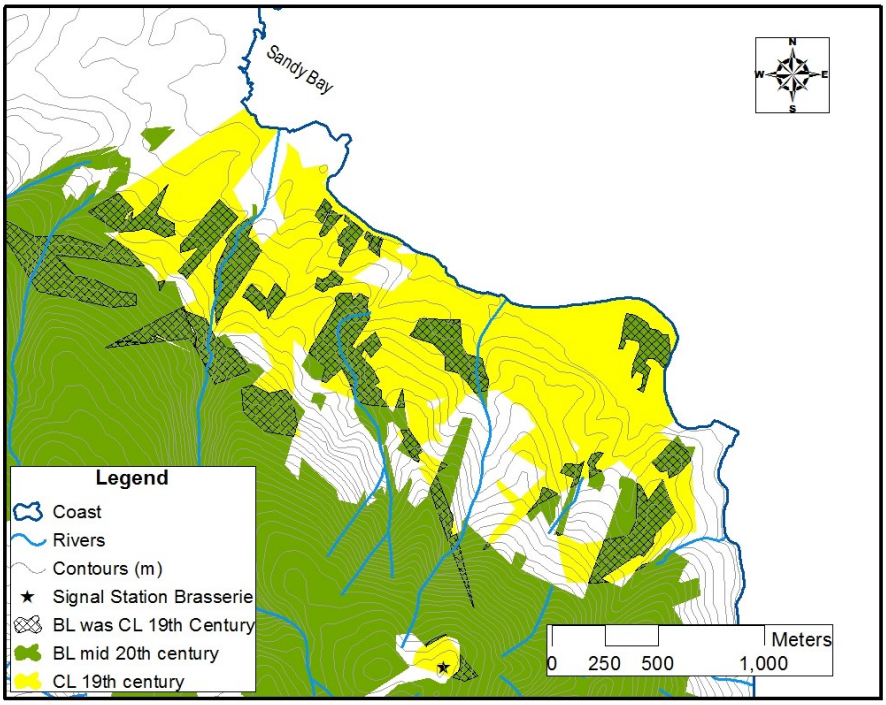

Figure 5.33: Cleared land in the 19th century shown as bushland by mid-20th century.

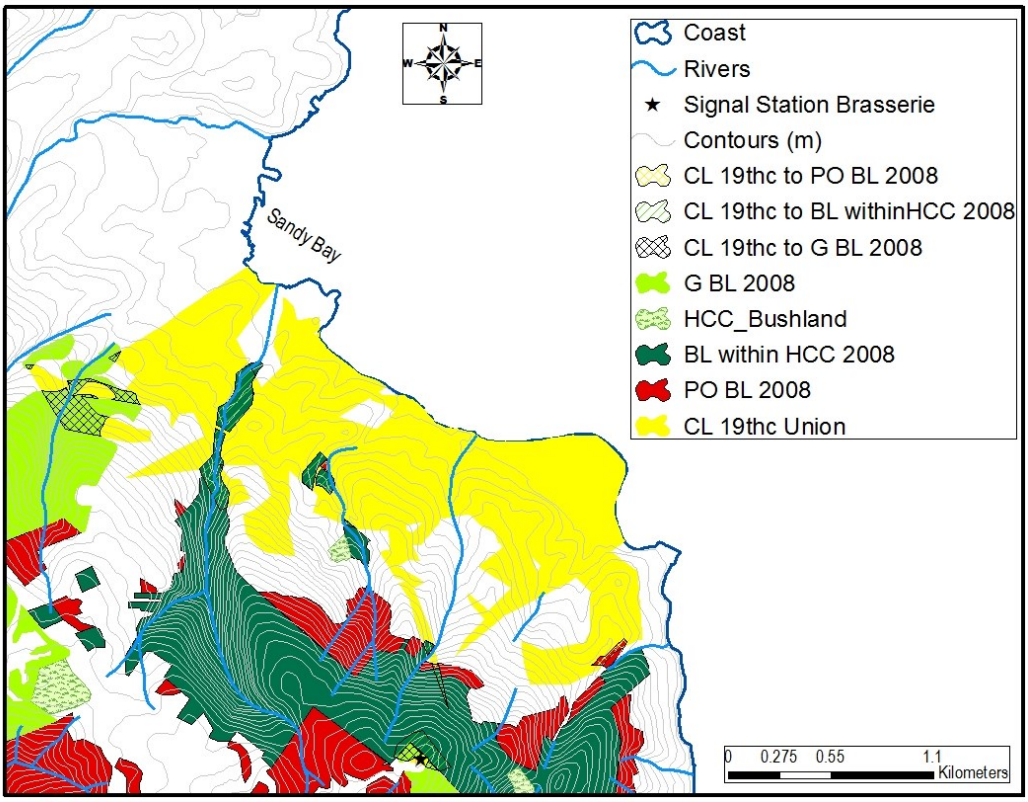

Figure 5.34: Areas cleared land in the 19th century under bushland by 2008.

5.10 Conclusion

Delineation of boundaries of cleared land offer useful initial guidance towards the reconstruction of vegetation type from the past (Leeson 2011). History of deforestation can be reconstructed using data provided in aerial photographs (Campos 1989) and in the examination of land clearance (Kirkpatrick 1991). This chapter has demonstrated that boundaries of land cleared in the past can also be extracted from visual records that pre-date photography.

Attempts to extract geospatial data from paintings by combining measurements with data from terrain models proved unreliable. Small inaccuracies in the location of features within the paintings are exaggerated when placed into the real world leading

to large errors in resulting coordinates. Similar problems were encountered by Fairbairn (2009b) in attempts to georeference photographs using the proprietary software PhotoModeler and Google SketchUp. Within this current research a method of rubber sheeting was adopted that used control points to fit a shape extracted from the painting onto the plane surface. Results are found to align with contours of the terrain to place the shape in the expected location. Further comparisons through time against terrestrial photography, where the same method was applied, and with aerial photographs also show consistency in the results. Resulting features such as lines and shapes can be integrated directly into GIS as layers allowing historical overlays to be created.

Information depicted in artworks from the 19th century and aerial photographs of the mid-20th century, compared with data of bushland of Hobart of 2008, has allowed mapping of those parts of Hobart where cleared land became bushland. This is a useful exercise in the assessment of modern land use (Kirkpatrick 2007), researchers with interests in land cover of today can now identify locations where original species remain, differentiating from areas where invasive species have moved in on land that was once cleared. For forest management, it indicates those parts of the remaining bush that will need special attention for weed management.

Chapter 6. Conclusions

6.1 Introduction

Spatial data in visual records has offered new insights in the study of the landscape of the past (e.g., Fensham 1989, McLoughlin 1999, Cronon 1992, Giblett and Tolonen 2012; Tuan 2013). While the traditional approach relies on written documents (Pedersen 1987), the use of visual records can offer details on arrangement of features and addition of details that were not so easily documented in writing. Also, utilizing details of geographic positions of features are useful for the formulation of cultural perspectives (Silbernage 2005). However, even when dealing with photographs, Geary (1986) suggests that caution be exercised in assessing a product that may be artificially influenced by the artist.

In the 19th century, artists made a significant contribution to the projection of the contemporary landscape around the city of Hobart. Some of these artists were convicts or ex-convicts, others were free settlers and visitors that travelled through the city. This investigation focused on the depiction of landscape during the 19th century, through assessment of pictorial records produced by contemporary artists as spatial representation of landscape of the time.

To provide new ways of benefiting from the information in historical artworks it was necessary to develop analytical approach that integrate theoretical and empirical methods. This was presented in Chapter 2. Inspection of unchanged topographic features and known locations of historical structures depicted in 19th century landscape pictures allowed determination of the perspectives adopted by the artists.

A technique was developed to use features from the landscape that have not changed through time to allow the location from which the painting was made to be determined, and this also provided the opportunity to gather further spatial information. A further product of this method is the ability to assess the degree of accuracy of artist' representations of reality. Residuals from the features used to reference the paintings and difference between horizontal and vertical scales indicate the degree of artistic license, and indicate the nature of the aesthetic principles adopted by the maker. The variation in accuracy suggests that the use of paintings for historical reconstruction and measurement of historic features should be preceded by an accuracy assessment.

Artworks were produced in various media and styles (Haynes 2003; Hansen 2003, 2012). The medium utilized, including drawing, water colour, lithograph and oil, was strongly influenced by profession. The government officers including the military and surveyors, sought to depict features of the landscape as they stood, or perhaps more of scientific observation than artistic. However, their work provided valuable records of the city and its topography. Natural elements such as ranges of hills and rivers in their natural state together with man-made elements exemplified in churches, roads and factories. Features that still exist, which allow data to be extracted from the artwork and geo-referenced for undertaking of spatial analysis.

Landscape depictions have been valuable for tourism (Walker 2008), culture and conservation for many nations (Antrop 2005; Timms 2008; Hughes et al 2011). It served to illustrate the expanse of open land in the Americas together with views of grazing and development offering potential settlers an incentive to move. Today, those same images

enabled developing hypothesis of land use in the past (Giblett and Tolonen 2012). Utilizing spatial techniques to investigate historical artworks has potential to provide information associate with the environments in the past as well as anthropogenic development of settlements contribute toward cultural identity of nations (Timms 2008; Hughes et al 2011). Such relationships that are reflected in the topographic features which interest the artists in the composition of the visual scene. However, the interpretation of surroundings can vary between individuals due to social influences as well as cultural values (Whyte 2002). Results of research presented in Chapter 3 of this thesis provide evidence that the profession of artists is a significant factor in research involving historical artworks. The government officers showed preference to certain locations, for example the Wharf area, they used the waterfront for depiction of many scenes. Social class also influenced production, where artists belong to the middle and upper classes produced landscape pictures. However, convicts artists, who were property of the state and allocated to free settlers (Short 1991), they also produced artwork depicting the landscape.

The medium used by artists to produce a picture has its importance in various ways, for example in the case of drawing, it was usually accomplished outdoors and on the spot, whereas, a painting which would involve the use colours and mixing procedures usually took place in the studio. The latter could lead to alteration of features which can be seen less detailed. Features from the 3 dimensional space will overlap and intertwine with each other on the 2 dimensional plane preventing a full portrayal of the scene (Casey 2002, p. 103). Features depicted were used by Van den Herik and Postma (2000), to distinguish paintings produced by different artists. The selection of features in relation to each individual artists

were considered in Chapter 4 where it was hypothesised that variation in background of the artists would have influences on the selection of features depicted in their art. Analysis showed that background of individuals had no influence on the selection of features. As the works by convicts and ex-convicts included features of nature and show elements indication of progress complying with activities during the period in which their artwork was produced. In terms of content of scenes determine from features selected, their works are comparable with those depicted by professional artists as well as the government officers.

In an interpretive approach conducted by William Cronon, (1992), the historical landscape paintings of the Hudson River were used as representative records of changes of the landscape. The artwork including drawings and paintings were categorised into three different phases. In the first phase, art show the untamed landscape followed by a phase where pictures showed the progress and modification to the surrounding landscape. In the third phase, art presented the civilised landscape in the form of construction through railways and founding of towns. In the current research, three stages based on timeframes were adopted to assess changes to the landscape around Hobart within the first century of colonisation. The first three decades of settlement, 1804-1830, define the time of the arrival of talented individuals who depicted the environment with seemingly untamed nature, natural resources and potential of development to attract immigrants. Security measures and order were portrayed to show control over the island in form of military Barracks and navy ships anchored in the River Derwent and churches. These elements were depicted in art, such as the work of Lieutent Charles Jefferys (1782-1826) Hobart Town in 1817. This era was followed by a prolific period, up to 1860, marked by the emergence of artists born in Tasmania.

Elements in the landscape were depicted to show potential of wealth and the progress of development as the city expanded over the surrounding hills and along the plains of the Derwent to the north of Hobart. During the last three decades of the century, as the city matured so did artwork. However, pictures unconsciously provided evidences of human modification to the local environment and results presented in Chapter 5 demonstrate how this information can prove useful for determination of changes in the landscape. Mapping of vegetation cover through time offers insight into to differentiate between native and invasive species, which in turn supports management of forests and park lands today (Parkes et al 2003; Underwood et al 2007). Such findings were made possible through the integration of geographic data acquired from historical landscape pictures, photographs, aerial images and contemporary map from the time of first settlement to present day.

6.2 Discussion

The composite formation of the society of Hobart permitted the examination of the background of individual artists and its influences on production of landscape art. The convicts and ex-convicts depicted various scenes and used different sites offering a wide range of views of the city and its environs. Some recorded historical events such as the first magnetic observation site on the island, whilst others focused on natural scenes to offer visual records of the developing colony and an exceptional contribution to the heritage of Australia (Howell and Xie 2013).

Considering that artists use artistic license, it is likely that the landscape will not be faithfully represented (Antonson 2009). With this in mind, the artistic license was systematically investigated utilizing photogrammetric techniques in solving the problem of

determining the accuracy of artists' depictions of landscapes. Trained artists produced fanciful works which were aesthetically pleasing, while those whose primary business related to matters associated with the land, such as military officers and surveyors, produced more accurate depictions offering a more reliable representation for geographical research.

The number of landscape artworks produced around Hobart peaked in the 1840's. Although some individuals were prolific, it was shown that the work of individuals had little impact on the whole. The trend in production can be related to economic factors with the time of peak production coinciding with stability of growth in settling the new colony. Later there was an increase in mobility towards the mainland, and while Hobart continued to grow the community may have had greater throughput of the population. The period of decline in production also coincides with the popularity of photography.

Migration from England to Tasmania was mainly for the purpose of gaining wealth through opportunities which were restricted in the homeland; however, the social status of the individual, as well as gender, was an important factor. Only women from the upper middle and middle class produced artworks, complying with the traditions of the English society of the same period. However, the female artists of Tasmania broke with European tradition by painting landscape, which was considered to be a masculine theme in Europe. Some of the few female artists offering full landscape paintings gained good reputations as artists and participated in regional exhibitions. During the period wherein male convicts produced pictures in Tasmania, the female convicts left records of their experiences in prison through poems and or letters. None of the female convicts are known to have produced artwork in the form of drawings or paintings.

Among the male artists, the social status and background of individuals showed variation in the type of work and media used. As expected, gender strongly influenced the medium used by women who worked in water colour or drawing (Guelke and Mor 2001; Broude and Garrard 1992), rather than in oil paint. There was also a difference in use of media amongst the male artists with military officers choosing to work in graphite, a medium that was readily available and matched their training; they focused on depiction of topography, shapes and outlines of elements. Otherwise, male artists worked in a variety of media. The first generation of Tasmanian born artists depicted features associated with the developed cultural landscape. Unlike their predecessors, the new generation of artists were challenged with the introduction of photography, which allowed the production of multiple scenes of landscape. Production of photographs of landscape gained popularity in Europe almost from its invention in 1839 (Protschky 2011, p. 73).

Distinctive compositional signatures of individual artists can be distinguished within these general propensities, with the background of the artist and the scenes depicted within the artwork both being reflected in compositional similarity. While studies have been conducted to consider colour and form (Blank et al 1984), this research investigated the notion of signature through features portrayed. As might be expected in a developing settlement, the mood of art changed through the century. Initially, the land was barren and the artwork showed progression of development around Hobart. Work by particular individuals were categorised, and the social status of the artist was found to be highly significant in their choice of a scene. It is notable that the travelling artists and convicts emphasised elements of the rural environment, whereas artists who migrated to the island to establish homes included

the urban areas. It was the latter group of artists who emphasised the development of society, placing their homestead within the surrounding landscape, whilst those passing through or sent by force found beauty in the natural environment alone.

As the settlement developed through the Century, land was cleared for development, for agriculture and to provide construction materials. Today, as concerns for the native natural habitat and maintenance of the indigenous species are of particular interest (Yates and Hobbs 1997), the history of land use is significant. In some areas, artworks are the only record of land use from the inception of settlement and techniques developed through this research offer a new approach to the extraction of spatial data from artworks. Based on prior knowledge of regions around Hobart where agriculture, clearance and industry are known to have existed, these particular areas were selected for this study. Research documented in previous chapters of this study then provides an awareness of the artists and their traits that allowed paintings to be selected with necessary caution for accuracy and detail. Resulting maps of land clearance that are validated through consistency between epochs of observation allow regions that were once cleared and that have returned to vegetation to be identified. Field observations may then be used to identify such areas that have been re-vegetated with invasive species for monitoring purposes.

6.3 Conclusion

Identification of the location utilized by each of the artists would be beneficial to the delineation of features depicted in pictures. In this regard, as recommended by other studies, including Cengiz (2014), it was important to carefully define the sites used to capture a scene. This research has followed other works in Australia (e.g. McLoughlin 1999, Terry, 1999;

Fensham 1989) which used artworks to investigate historic landscapes and ecological processes. Progress has now been made in considering particulars of the artists and the features they portrayed together with quantification of accuracy achieved. In spite of the high precision of work produced by some artists, geometrical techniques were found to be inaccurate. Small differences in geometry led to large discrepancies in the spatial referencing of areas of land. Instead, use of modern data presentation tools such as Google Earth and ArcMap were employed for comparison of the scenes of the landscape, and extraction of data from the representations. The techniques were developed on a selection of historic artworks representing Hobart, which is part of a larger collection of pictures depicting other sites in Tasmania. These techniques can now be applied to investigate other important locations utilizing historic art.

There is enormous potential for the extraction of other quantitative information from landscape art for geographical or historical purposes (Protschky 2011). For example, in mapping the distribution and measuring the heights of buildings as part of archaeological investigations, in determining the spatial location of vegetation boundaries and the heights of trees, as well as in measuring and mapping geomorphic features. In places that have been painted frequently there is the possibility of measuring change in all these attributes of the landscape. However, as images may have been made for political or financial advantage (Trnkova 2011), particular care has to be observed to triangulate data from visual records with other forms of historic geographical record.

References

Adams, AJ 2002, 'Competing communities in the "Great Bog of Europe" identity and seventeenth century Dutch landscape painting', in WT Mitchell & WJT Mitchell (eds), *Landscape and power*, University of Chicago Press, pp. 35-76.

Adams, S & Robins, AG (eds), 2000, *Gendering landscape art*, Manchester University Press.

Adams, S 2013, 'The fault of being purely French: The practice and theory of landscape painting in post-revolutionary France', *Art History*, 36, 4, pp. 740-767.

Adorno, TW 1997, *Aesthetic theory*. trans. R Hullot-Kentor, University of Minnesota Press, 329.

Aitken, R 2007, *The Art of the Collection*, Melbourne University Publish, vol. 94.

Alan, J 1989, *Backsight: a history of surveying in colonial Tasmania*. Institution of Surveyors of Australia, Hobart.

Alexander, A 2006 (ed.), *The Companion to Tasmanian History,* Centre for Tasmanian Historical Studies, University of Tasmania.

Alexander, A 2009, 'Drought, bushrangers, blight and more: The Horrors of early farming', Papers and Proceedings*,Tasmanian Historical Research Association,* vol. 56, no. 2, pp. 170-177

Alphan H & Sönmez F 2014, 'An assessment of seascape visibility for coastal land use planning in the Mediterranean region of Turkey', in R Efe & M Öztürk (eds), *Tourism, environment and ecology in the Mediterranean region*, Cambridge Scholars Publishing, pp. 221-230.

Andrews, M 1989, The search for the picturesque; landscape, Aesthetics and tourism in Britain 1760–1800, Stanford University Press, California.

Antonson, H 2009, 'Landscapes with history: addressing shortcomings in Swedish EIAs', *Land Use Policy*, vol. 26, no. 3, pp. 704-714.

Antrop, M 2005, 'Why landscapes of the past are important for the future', *Urban Environmental Pollution*, vol. 70, no. 1, pp. 21-34.

Archer, KL 2013, 'Landscape art in the 19th century', in B Black, D Hassenzahl, J Stephens, G Weisel & N Gift (eds), *Climate Change, an Encyclopaedia of Science and History,* ABC-CLIO, LLC, vol. 3, pp. 967-974.

Archer, S 1989, 'Have southern Texas Savannas been converted to woodlands in recent history?', *The American Naturalist,* vol. 134, no. 4, pp. 545–561.

Atkinson, J 2005, *Mary Proctor, convicts, pioneer and settler*, Rosenberg Publishing Pty Ltd, New South Wales.

Auerbach, J 2004, 'The picturesque and homogenisation of empire', *the British Art*, vol. 5, no. 1, pp. 47-54.

Austin, J 2014, 'Artists' works provide valuable historical information for climate scientists', *Decoded Science,* viewed 14 October 2014, *<http://www.decodedscience.com/artists-works-provide-valuable-historical-information-climate-scientists/43968>*.

Backhouse, J 1843, *A narrative of a visit to the Australian colonies*, Johnson reprint, 1967, New York.

Bacon, CA, Calver, CR & Pemberton, J 2008, *The industrial mineral deposits of Tasmania*, Department of Infrastructure, Energy and Resources.

Baker, J & Thornes, JE 2006, 'Solar position within Monet's Houses of Parliament' *Proceedings: Mathematical, Physical & Engineering Sciences,* Royal Society, vol. 462, no. 2076, pp. 3775-3788, viewed 13 January 2013, < http://www.jstor.org/stable/20209098>.

Barrett, T 2011, *Criticizing art: understanding the contemporary*, NY: McGraw-Hill, New York.

Barthes, R 1981, *Camera Lucida; reflection on photography*, Hill and Wang, New York.

Bartlett, A 1982, *Drawing and painting the landscape*, Phaidon, Oxford.

Bate, D 2000, 'Notes on beauty and landscape', in L Wells, K Newton, & C Fehily (eds), *Shifting horizons: women's landscape photography now*, IB. Tauris, London, pp. 132-140.

Bell, C & Lyall, J 2002, *The accelerated sublime: landscape, tourism, and identity*, Greenwood, Westport.

Berleant, A 1991, *Art and Engagement,* Temple University Press, Philadelphia.

Bermingham, A 1986, *Landscape and ideology English rustic tradition 1740-1860,* University of California Press.

Barnard, G 1871, *The theory and practice of landscape painting in water colours illustrated by a series of twenty-six drawing and diagrams in colours and numerous woodcuts,* G. Routledge, New York.

Bertram, E, Muir, S & Stonehouse, B 2007, 'Gateway ports in the development of Antarctic tourism', in J Snyder & B Stonehouse, *Prospects for polar tourism,* CABI, UK, pp. 123-46.

Blank, P, Massey, C, Gardner, H, & Winner, E 1984, 'Perceiving what paintings express', *Advances in Psychology*, vol. 19, pp. 127-143.

Bonwick, J 1967, Bushrangers illustrating the early days of Van Diemen's Land, Cox Kay, Tasmania.

Bonyhady, T 2003, *The colonial earth,* Melbourne University Press.

Boyce, J 2008, *Van Diemen's land*, 1st edn, Black Incbooks, Melbourne.

Brady, E 2003, *Aesthetics of the natural environment,* Oxford University Press.

Brand, D 2004, 'Surveys and sketches: 19th-century approaches to colonial urban design', *Urban Design*, vol. 9, no. 2, pp. 153-175.

Brik, O 1926, 'Photography versus painting', in C Harrison & P Wood (eds), *Art in Theory in 1900-1990: An anthology of changing ideas*, Blackwell Publishers, Oxford, pp. 454-57.

Bronwyn, H 2003, Re-gender the landscape in New South Wales, viewed 1 March 2012, <http://www.environment.nsw.gov.au/resources/cultureheritage/genderedLPLitrev.pdf>.

Broude, N & Garrard, MD (eds), 1992, *The expanding discourse feminism and art history*, Harper Collins, New York.

Budd, L 2009, 'The view from the air: the cultural geographies of flight', in P Vannini (ed.), *The cultures of alternative mobilities, Routes Less Travelled*, Ashgate, Burlington, pp. 71-90.

Burke, J 1975, *Australian women artists one hundred years 1840-1940*, Ewing and George Paton Galleries, Melbourne.

Burmester, A 1983, Far Eastern lacquers: classification by pyrolysis mass spectrometry, *Archaeometry*, vol. *25*, no.1, pp. 45-58.

Burrough, PA 2001, 'GIS geostatistics essential partners for spatial analysis', *Environmental and Economical Statistics*, vol. 8, no. 4, pp. 361-377.

Campbell, CE 2005, *Shaped by the west wind; nature and history Georgian Bay*, University of British Columbia Press, Vancouver.

Campos, JB 1998, 'Spatial and multi-temporal analysis of deforestation and quantification of the remnant forests on Porto Rico Island, Parana, Brazil', *Brazilian archieves Biology and Technology*, vol. 42, no. 1.

Carlson, A & Lintott, S 2008, *Natural aesthetic value and environmentalism: from beauty to duty*, Columbia University Press.

Carlson, A 2005, Aesthetics and the environment the appreciation of nature, art and architectur, Routledge, London.

Carlyle, L 1995, 'Beyond a collection of data what we can learn from documentary', in AWallert, A Hermens & M Peek, *Historical painting techniques materials and studio practice*, the Getty Conservation Institute , University of Leiden, Netherland, pp. 1-5.

Carr, E 1888, 'Garden and Forest and" Landscape Art', *Garden and Forest*, vol. 1, no. 30, pp. 1-8, viewed 22 May 2012, <http://128.103.155.30/pdf/articles/2000-60-3-garden-and-forest-and-landscape-art.pdf>.

Casey, ES 2002, *Representing place: landscape painting and maps*, University of Minnesota Press.

Cash, M 1911, *The Bushranger of Van Diemen's Land in 1843-1844: A personal narrative of his exploits in the bush and his experiences at Port Arthur and Norfolk Island*, J. Walch, Hobart, Tasmania.

Cengiz, T 2014, 'Visual quality method in assessing landscape characteristics: case study of Bozcaada Island', *Coastal Research*, vol. 30, no. 2, pp. 319-327.

Chamberlain, S 1988, *The Hobart whaling industry 1830-1900*, PhD thesis, Latrobe University, Victoria.

Chodorow, N 2001, 'Family structure and feminine personality' in D Juschka (ed.), *Feminism in the study of religion,* Continuum, London, pp 81-105.

Ciarlo, D 2011, *Race and visual culture in imperial Germany advertising Empire*, Harvard University Press, USA.

Cimin, M & Massacci, P 2003, 'Landscape modeling and mining depletion simulation to visual impact evaluation', *Proceeding Modeling Identification and Control*, pp.438-442.

Clark, K 1956, *landscape into art,* Penguin Books, Victoria, UK.

Corner, J 1999, 'Eidetic operations and new landscapes', in J Corner (ed.), *Recovering landscape: essays in contemporary landscape theory*, Princeton Architectural Press, 153-169.

Cosgrove, DE 1979, 'John Ruskin and geographical imagination', *American geographical society*, vol. 69, no. 1. pp. 43-62.

…….. 1984, *Social formation and symbolic landscape,* University of Wisconsin Press.

…….. 1985, 'Prospect perspective and evolution of the landscape idea', *Royal Geographical Society*, vol. 10, no 1, pp. 45-62.

…….. 1988, 'The geometry of landscape practical and speculative art in sixteenth century Venetian land territories', in D Cosgrove & S Daniel, '*Iconography of landscape'*, Cambridge university press, pp. 254-277.

…….. 1993, *The Palladian landscape: geographical change and its cultural representations in sixteenth-century Italy*, Pennsylvania State Press.

Council of Europe 2000, European landscape Convention, viewed 22 November 2014, <http://conventions.coe.int/Treaty/en/Treaties/html/176.htm>.

Craig, C & Mead, I 1963, 'Frederick Strange 1807-1873', in *Papers and Proceedings of the Royal Society of Tasmania*, vol. 97, pp.49-51.

Cronon, W 1992, 'Telling Tales on Canvas: Landscapes of Frontier Change', in JD Prown (ed.), *Discovered Lands, Invented Pasts: Transforming Visions of the American West*, Yale University Press, pp. 37-87.

Cross, PA 1983, Advanced least squares applied to position fixing, North East London Polytechnic.

Dadjiafxendi, K & Zakreski, P (eds) 2011, What is a woman to do? a reader on women, work and art C. 1830-1890, Peter Lang, Bern, Switzland.

Daniels, S & Cosgrove, D 1988, 'Introduction: iconography and landscape', in D Cosgrove & S Daniels (eds), *The iconography of landscape: Essays on the symbolic representation, Design and use of past Environments*, Cambridge University Press, pp. 1-10.

Daniels, S, Seymour, S & Watkins, C 1997, 'Border country: The politics of picturesque in the Middle Wye Valley', **i**n ML Rosenthal, C Payne & S Wilcox (eds), *Prospects for the nation: recent essays in British landscape*, 1750-1880, Yale University Press, pp. 157-82.

de Boer, A 2010, 'Processing old maps and drawings to create virtual historic landscape', *e-Preimetron*, vol. 5, no. 2, pp. 49-57.

de Boer, A, Breure, L, Spruit, S & Voorbij, H 2011, Virtual historical landscapes, *Research in Urbanism Series*, vol. 2, no.1, pp. 185-203.

Dewey, J 1934, *Art as experience,* Penguin Group, USA.

Dinnerstein, D 1976, *The mermaid and the minotaur*, Harper and Row, New York.

Dixon, J 1839, The condition and capabilities of Van Diemnen's land as a place of emigration being the practical experience of nearly ten years' residence in the colony, Smith, Elder and Cornill, London, viewed 3 March 2014, <digital.slv.vic.gov.au/dtl_publish/pdf/marc/46/827686.htm>.

Duffield, I 1986, ‘From slave colonies to penale colonies; the west indies convict transportation to Australia’, *Slavery and Aboltion*, vol. 7, no. 1, pp. 25-45.

Ece, A 2006, ‘Clustering with GIS: an attempt to classify Turkish district data’, *XXIII International Federation of Surveyors Congress: shaping the change,* 8-13 October 2011, Munich, Germany.

Eckbo, G 1974, ‘Art, Science, technology, democracy and the landscape’, *Landscape Planning,* vol. 1, pp. 51-55.

Egerton, J 1984, 'George Stubbs and the landscape of Creswell Crags', *The Burlington Magazine*, no. 981, p. 738.

Eldershaw, PR 2012, *Frankland George (1800-1838),* Australian Dictionary of Biography, National Centre of Biography, Australian National University, viewed 23 December 2012,< http://adb.anu.edu.au/biography/frankland-george-2064/text2571>.

Elkins, J 1999, *What painting is*: How to think about oil painting, using the language of alchemy, Routledge, London.

Evans, GW 1822, A geographical, historical, and topographical description of Van Diemen’ land: with important hints to emigrants, and useful information respecting the application for grants of land, John Souter, London.

Ewins, R 2001, *A personal view of Tasmania’s history*, part 2, Convicts and penitentiaries, viewed 19 December 2012, < http://www.justpacific.com/tasmania/convict.html>.

Fairbairn, D 2009a, ‘Rejecting illusionism transforming space into maps and into art’ in W Cartwright, G Gartner & A Lehn (eds), *Cartography and art*, Spinger, pp. 1-12.

…….. 2009b, ‘Using vedute to source geospatial information: data flowline and accuracies’, e-Perimetron, vol. 4, no. 2, pp. 131-139, viewed 15 November 2013, <http://www.e-perimetron.org/Vol_4_2/Fairbairn.pdf>.

Farag-Miller, M, Miller, K & Kirkpatrick, JB, 2012, ‘Determining the Accuracy of Historical Landscape Paintings’, *Geographical Research,*vol. 51, no. 1, pp. 49-58.

Fensham, RJ 1989, ‘The Pre-European vegetation of the Midlands, Tasmania: floristic and vegetation patterns’, *Biogeography,* vol. 16, pp. 29-45.

Fischer, V 2008, ‘Landscape as a category of cultural sciences’, *Zeitschrift Fur Volkunde,* vol.104, pp. 19-39.

Fisher, P 1991, ‘First experiments in viewshed uncertainty: the accuracy of the viewshed area’, *Photogrammetric Engineering and Remote Sensing*, vol. 57, no. 10, pp. 1321-1327.

Flinn KM , Vellend, M.& Marks, PL. 2005, ‘Environmental causes and consequences of forest clearance and agricultural abandonment in central New York’, *Biogeography* , vol. 32, no. 3, pp. 439-452.

Gauch, HG 1982, *Multivariate analysis in community ecology*, Cambridge University Press.

Gaynor, A & McLean, I 2008, ‘Landscape histories: mapping environmental and ecological change through the landscape art of the Swan River Region of Western Australia’*, Environment and History*, vol. 14, no. 2, pp. 187-204.

Geary, CM 1986, 'Photographs as materials for African history: some methodological considerations', *History in Africa*, vol. 13, pp. 89-116.

Geddes, K 2011, *The new arcadia*, exhibtion ctalogue, 23 July- 3September 2011, Lismore Regional Gallery, NSW.

Giblett, RJ & Tolonen, JP 2012, *Photography and landscape*, Intellect, UK.

Gillian, R 1993, *Feminism Geography, the limits of geographical knowledge*, University of Minnesota Press.

Gilpin, W 1972, Three essays : on picturesque beauty, on picturesque travel, and on sketching landscape , to which is added a poem on landscape painting, 2nd ed., Farnborough, Eng. Gregg.

Goodchild, MF 2008, 'Combining space and time : new potential for temporal GIS', in AK Knowles & A Hillier, *placing history; how maps, spatial data and GIS are changing historical scholarship*, ESRI Press, pp. 179-182.

Gooding, J 2007, 'The politics of a panorama: Robert Dale and King George Sound', in N Etherington (ed.), *Mapping Colonial Conquest Australia and Southern Africa,* University of Western Australia Press.

Goodridge CM 1832, *Narrative voyage to the south seas: with the shipwreck of the Pricess of Wales cutter on one of the Crozets, uninhabited islands; with an account of a two years' residence on them by the crew and their delivery by an American schooner*, Hamilton and Adams, London.

Gotway, C & Young, L 2002, 'Combining Incompatible Spatial Data', *the American Statistical Association*, vol. 97, no. 458, p. 632-648, viewed 19 June 2013, <http://www.jstor.org/stable/3085677>.

Gough, P 2009, 'Calculating the future panoramic sketching, reconnaissance drawing and the material trace of war', in P Cornish & N Saunders (eds), *Contested Objects: Material Memories of the Great War,* Routledge, London, pp. 237-51.

Gracyk, T 2012, *The philosophy of Art: an introduction,* Polity Press, Cambridge, UK.

Guelke, JK, & Morin, KM 2001, 'Gender, Nature, Empire: Women Naturalists in Nineteenth Century British Travel Literature', *Royal Geographical Society*, *the Institute of British Geographers*, vol. 26, no. 3, pp. 306-326.

Halkes, P 2006, Aspiring to landscape: on painting and the subject of nature, University of Toronto Press Incorporated.

Hansen, D (ed.) 2003, *John Glover and the colonial picturesque,* Tasmanian Museum and Art Gallery and Art Exhibitions, Hobart.

Hansen, D 2012, An interview for Film Australia's Wilderness, viewed 4 May 2012, <http://www.filmaust.com.au/wilderness/pdf/davidhansen_transcript.pdf>.

Harris, RW 1951, 'Use of aerial photographs and sub-sampling in range inventories', *Range Management Archives*, vol. 4 no.4, pp. 270-8.

Harrison, B 1910, *Landscape painting,* HATHI Trust Digital Library, viewed 11 October 2012,< http://hdl.handle.net/2027/wu.89056203854>.

Harrison, S 1991, ‘Local extiction in metapopulation context an emprical evaluation’, *Biological Journal of the Linnean Society*, vol. 42, no 1-2, pp. 73-88.

Haynes, R. 2003, ‘From habitat to wilderness: Tasmania's role in the politicising of place’, in DS Trigger & G Griffiths (eds), *Disputed territories: land, culture and identity in settler societies*, Hong Kong University Press, vol. 1, pp. 81-107.

Hedges, SB 2008, ‘Image analysis of renaissance copperplate prints’, in DG Stork & J Coddington (eds),*Computer image analysis in the study of art,* Bellingham.

Helmreich, A 2000, ‘The marketing of Helen Allingham’ in S Adams & AG Robins (eds), *Gendering landscape art*, Manchester University Press, pp. 45-60.

Henriques, F & Gonçalves, A 2010, ‘Analysis of lacunae and retouching areas in panel paintings using landscape metrics’, in I Marinos, F Diter, G Andreas & GH Diofantos (eds), *Digital heritage,* Springer, Berlin, pp. 99-109, viewed 17 August 2013,< http://link.springer.com/chapter/10.1007/978-3-642-16873-4_8#page-1>.

Henzell, T 2007, Australian agriculture its history and challenges, CSIRO Publishing, Australia.

Heringman, N 2004, *Romantic rocks, aesthetic geology*, Cornell University Press, London.

Herrera, AO 2011, Cuban artists across the diaspora; setting the tent against the house, University of Texas Press, USA.

Hewitt M 2004, ‘Class and the classes’, in C Williams (ed.), *A companion to 19th-century Britain*, Blackwell Publishing Ltd, pp. 305-320.

Hindmarch, B 2002, ‘Yoked to the plough; male convict labour, culture and resistance in rural van Die’8men’s Land, 1820-4’, PhD Thesis, University of Edinburgh Library.

Hislop, K 2013, ‘Open to interpretation a study of the urban implications of nineteenth-century topographic drawings of the Swan River Colony’ in *Proceedings of the Society of Architectural Historians,Australia and New Zealand,* vol. 1, pp. 247-57.

Hodgman, VW 1967,’ *Prout, John Skinner (1805–1876*)’, Australian Dictionary of Biography, viewed 5 December 2012< http://adb.anu.edu.au/biography/prout-john-skinner-2565\text3501>.

Hoorn, J 1990, The Lycett album drawings of the Aborigines and Australian scenery. National Library of Australia.

Howard, P 1991, *Landscape: the Artists’ Vision*, Routledge, London.

Howell, M & Xie, L 2013, *Convicts and the arts,* Palmer Higgs Pty Ltd.

Howkins, A 1997, ‘Land, Locality, People, Landscape: the Nineteenth-Century countryside’, in ML Rosenthal, P Christiana, & S Wilcox (eds), *Prospects for the Nation, Recent essays in British landscape*, Yale University Press, pp. 97-114.

Huang, JZ , Michael K, Ng HR & Li Z, 2005, ‘Automated variable weighting in k-means type clustering’, *Pattern Analysis and Machine Intelligence, IEEE Transactions on* 27, no. 5, pp. 657-668.

Hughes, JM, Graham, DJ, Jacobsen, CR & Rockmore, DN 2011, 'Comparing Higher-order spatial statistics and perceptual judgements in the stylometric analysis of art', in *Proceedings*

of the European signal processing Conference, 2 September 2011, Barcelona, pp. 1244-1248.

Hughes, ML, McDowell, PF & Marcus, WA 2006,' Accuracy assessment of georectified aerial photographs: implications for measuring lateral channel movement in a GIS', *Geomorphology*, vol. 74, no. 1, pp. 1-16.

Hunter, L 2003, *Famous Australian artists,* New Holland, Australia.

Jones, J 2010, *Robert Dowling, Tasmanian son of empire,* National Gallery of Australia, Canberra.

Jongman, RH, Ter Braak, CJ, & van Tongeren, OF (eds) 1995, *Data analysis in community and landscape ecology*, Cambridge university press.

Jordan, C 2002, 'Progress versus the picturesque: white women and the aesthetics of environmentalism in colonial Australia 1820-1860', *Art History,* vol. 25, no. 3, pp. 341-57.

Julio, H, Lorenzo, G & Francisco, A 2004, 'Assessment of the visual impact made on the landscape by new buildings; a methodology for site selection', *Landscape and Urban Planning*, vol. 68, no. 1, pp., 15-28.

Jungerius, PD & van den Ancker, J 2012, "Landscape paintings of the 17th and 19th century as a tool for coastal zone management." *EGU General Assembly Conference Abstracts*. Vol. 14, p. 1104.

Kadmon, R & Harari Kremer, R 1999, 'Landscape-scale regeneration dynamics of disturbed Mediterranean Maquis', *Vegetation Science*, vol. 10, no. 3, pp. 393–402.

Kairan, LK Woudstra, J & Feng, W 2010, 'Views versus eight scenes: the history of Bajing tradition in China', *Landscape Research,* vol. 3, no. 5, pp. 83-110.

Katz, MR 1995, William Holman Hunt and the Raphaelite technique', in A Wallert, A Hermens & M Peek (eds) *Historical painting techniques materials and studio practice*, the Getty Conservation Institute , University of Leiden, Netherland, pp. 158-165.

Keane, M 2013, *Japanese garden design*, Tuttle Publishing, Japan.

Kellner, JR, Asner GP, Cordell S, Thaxton JM, Kinney KM, Kenndy-Bowdoin, T, Knapp, DE , Questad, EJ, & Ambagis S (eds) 2012, 'Historical land-cover classification for conservation and management in Hawaiian subalpine drylands', *Pacific Science*, vol. 66, no. 4, pp. 457-66.

Kennedy, D 1876, Kennedy's colonial travel: a narrative of a four years tour through Australia, New Zealand, Canada Etc., Cambridge Library collection, History of Oceania.

Kerr, J 1992, *The dictionary of Australian artists: painters, sketchers, photographers and engravers to 1870,* Oxford University Press, Melbourne.

Keynes, RD 1979, 'Hobart Town', in RD Keynes (ed.), *Charles Darwin's Beagle Diary*. Cambridge University Press, pp. 308-310.

Kirkpartick, JB & Dickinson, KJM 1984, *1:500 000 Vegetation Map of Tasmania*, Forestry Commission, Tasmania.

Kirkpatrick, JB 1991, 'The magnitude and significance of land clearance in Tasmania in the 1980s'*, Tasforests*, vol.3, pp. 1-14,

Kirkpatrick, JB 2007, 'History', in JB Kirkpatrick & KL Bridle (eds), *People, sheep and nature conservation: the Tasmanian experience,* CSIRO Publishing, Collingwood Victoria, pp. 1-44.

Kirsh, A & Levenson, RS 2000, Seeing through paintings: physical examination in art historical studies, Yale University Press, New Haven.

Klonk, C 1997, 'From picturesque travel to scientific observation: artist and geologist voyages to Staffa', in ML Rosenthal, C Payne & S Wilcox (eds), *Prospects for the nation: recent essays in British landscape, 1750-1880*, Yale University Press, pp. 205-29**.**

Kolenberg, H & Kolenberg, J 1987, Tasmanian vision: the art of the nineteenth century Tasmania: paintings, drawings and sculpture from European exploration and settlement to 1900, The Tasmanian Museum and Art Gallery, Hobart.

Kramer, H, Houtkamp, JM & Danes, M 2011, 'Things have changed: A visual assessment of a virtual landscape from 1900 and 2006', in E Buhmann, S Ervin, D Tomlin & M Pietsch (eds), *Teaching Landscape Architecture Preliminary,* Proceedings at Anhalt University of Applied Sciences*,* Bernburg, pp. 375-384.

Kuitert, W 1988, 'Themes, scenes, and taste in the history of Japanese garden art', *Japonica Neerlandica*, JC Gieben, Vol. 3. Wageningen, Netherland.

Lappé, A & Lappé, FM 2013, 'landscape art in the 19th century', in BC Black, DM Hassenzahl, JC Stephens, G Weisel & NG Gift (eds), *Climate change an Encyclopaedia of Science and History*, vol. 1, pp. 967-974.

Laurie, I 1975, 'Aesthetic factors in visual evaluation', in E Zube, R Brush & J Fabos (eds), *Landscape Assessment: values, perceptions and resources*, Hutchinson and Ross Dowden, pp. 103-117.

Law, SS 2011, 'Being in traditional Chinese landscape painting', *Intercultural Studies*, vol. 32, no. 4, pp. 369-382.

Lee, J 1991, 'Analysis of visibility sites on topographic surfaces', *International Journal of Geographical Information System,* vol. 5, no. 4, pp 413-29.

Leeson, KE 2011, Gauging environmental variation in the rejuvenation potential of disturbed natural ecosystems, Dissertation, University of Tasmania.

Lepš, J & Šmilauer, P 2003, *Multivariate analysis of ecological data using CANOCO*, Cambridge university press.

Lettner, M & Sablatnig, R 2008,' Estimating the original drawing trace of painted strokes', In *Electronic Imaging,* pp. 68100C-68100C, International Society for Optics and Photonics.

Lien, ME & Melhuus, M 2007, Holding Worlds Together: Ethnographies of Knowing and Belonging, Berghahn Books, New York.

Lien, ME 2007, 'Weeding Tasmanian bush: biomigration and landscape imagery', in ME Lien & M Melhuus, *Holding worlds together: Ethnographies of knowing and belonging*, Berghahn Books, New York, pp. 103-121.

Lindenmayer, D & Burgman MA 2005, *Practical conservation biology*, CSIRO, Australia.

Macintyre, S 2009, *A concise history of Australia*, Cambridge University Press, New York.

Maichak, EJ & Schuler, K L 2004, 'Applicability of viewshed analysis to wildlife population estimation', *The American Midland Naturalist,* vol. 152, no. 2, pp. 277-285.

Malcolm, A 1999, *Landscape and Western Art*, Oxford University Press, New York.

Martinez, K & Goodall, S 2008, 'Colour clustering analysis for pigment identification', in DG Stork & J Coddington (eds), *Computer image analysis in the study of art*, Proceedings of the SPIE, Bllingham, vol. 6810, pp. 1-8.

Masten, AF 2008, Art Work: Women Artists and Democracy in Mid-Nineteenth Century New York, University of Pennsylvania Press, Philadelphia.

McCrank, LJ 2002, Historical information science: an emerging unidiscipline, Information Today Inc., New Jersey.

McLoughlin, LC 1999, 'Vegetation in the early landscape art of the Sydney region, Australia: accurate record or artistic licence', *Landscape Research*, vol. 24, no. 1, pp. 25-47.

McMahon, CG 2003, 'The Sign System in Chinese landscape paintings', *Aesthetic Education,* vol. 37, no.1, pp. 64 -76.

Melville, H 1833, *Van Diemen's Land: Comprehending a variety of statistical and other information likely to be interesting to the emigrant, as well as to the general reader*, Smith Elder, London.

Melzer, T, Kammerer, P & Zolda, E 1998, 'Stroke detection of brush strokes in portrait miniatures using a semi-parametric and a model based approach', in *Pattern Recognition, International Conference,* vol. 1, pp. 474-474, IEEE Computer Society.

Merchant, C 2007, *American environmental history; an introduction*, Columbia University Press, USA.

Mitchell, N, Rössler, M & Paulson, R 1975, 'Types of demarcation: townscape and landscape painting'*, Eighteenth-century studies,* vol.8, no. 3, pp. 337-354.

Mitchell, R 2000, Picturing the past: English history in text and image 1830-1870, Oxford University Press, New York.

Mitchell, WT & Mitchell, WJT (eds), 2002, *Landscape and power*, University of Chicago Press

Monk, J 1984, 'Approaches to the Study of Women and Landscape', *Forestry history Society and American for environmental History,* Vol. 8, no. 1, pp. 23-33.

Morey, S 2009, 'A rhetorical look at ecosee', in SI. Dobrin & S Morey (eds), *Ecosee: Image, Rhetoric, Nature*, SUNY Press, pp, 1-22.

Morgan, K 2012, *Australia; a very short introduction*, Oxford University Press, Oxford.

Morgan, S 1992, Land settlement in early Tasmania; creating an antipodean England, Cambridge University Press, New York.

Murray, AS 1900, Tasmanian rivers, lakes, flowers: with facsimile representation in colour of numerous sketches by author, George Robertson, Melbourne.

Musson, AE 1959, 'The great depression in Britain, 1873-1896: a reappraisal', *Economic History*, vol. 19, no. 2, pp. 199-228.

Neuberger, H 1970, ‘Climate in art’, *Weather,* vol. 25, no. 2, pp. 46-56.

Nicholas, FW & Nicholas, JM 2008, *Charles Darwin in Australia* , Cambridge University Press.

Nilsson, K, Pauleit S, Bell S, Aalbers C & Nielsen, TS (eds), 2013, *Peri-urban futures: scenarios and models for land sue change in Europe,* Springer-Verlag Berlin.

Nordstrom, KF & Jackson, NL 2001, ‘Using Paintings for Problem-solving and Teaching Physical Geography: Examples from a Course in Coastal Management’, *Journal of Geography*, vol. 100, no. 5, pp. 141-151.

Norton, L 2009, *Women of Flowers: Botanical Art in Australia from the 1830s to the 1960s*, National Library Australia.

Ode, A & Miller, D 2011, ‘Analysing the relationship between indicators of landscape complexity and preference’, *Environment and Planning*, vol. 38, pp. 24-40.

Offen, K 2013, 'Historical geography II: Digital imaginations', *Progress in Human Geography*, vol. 37, no. 4, pp. 564-577.

Orr, CC 1995, ‘The corinne complex: gender, genius and national character’, *Women in the Victorian Art World,* pp. 89-106.

Osborne, BS 1988, ‘The iconography of nationhood in Canadian art’, in, D Cosgrove & S Daniels (eds), *The iconography of landscape: Essays on the symbolic representation, Design and use of past Environments*, Cambridge University Press, pp. 162-178.

Padilla, C 2008, 'Historical GIS: mapping the past to understand the future', *Online*, 32, no.2, pp. 32-35.

Parkes, D, Newell, G & Cheal, D 2003, Assessing the quality of native vegetation: the ‘habitat hectares’ approach’, *Ecological Management & Restoration*, vol. 4, no.(s1), pp. 29-38.

Patias, P 2004, ‘Photogrammetry in the Visualization Era’, FIG Working Week, Athen pp. 22-27.

Paull, J 2011, ‘Environmental management in Tasmania; Better off dead?’, in G Baldacchino & D Niles (eds), *Island future; conservation and development across the Asia-Pasific Region,* Springer, London, no. 2, pp. 153-168.

Pearson, M 1983, ‘The technology of whaling in Australian waters in the 19th century’, The *Australian Journal Historical Archaeology*, pp. 40-54.

Pedersen, D 1987, ‘The photographic records of the Canadian YWCA, 1890–1930: A Visual Source for Women's History’, *Archivaria*, vol. 1, No. 24.

Perry, G & Rossington, M 1994, *Femininity and masculinity in 18th-century art and culture*, Manchester university press.

Peters, BC 1978, ‘Michigan's oak openings: pioneer perceptions of a vegetative landscape’, *Forest History,* vol. 22, no**.** 1, pp. 18–23.

Peuquet, DJ 1984, ‘A Conceptual framework and comparison of spatial data models’, *Cartographica the International Journal for Geographic Information and Gevisualization,* University of Toronto Press, vol. 21, no. 4, pp 66-113.

Pike, D 1962, *Australia: the quit continent*, Cambridge University Press, London.

Plowman, P 2004, *Ferry to tasmania a short history*, Rosenberg Publishing Pty Ltd, Australia.

Prasetyo, LB, Kartoijadjo, H & Adiwibowo S 2009, 'Spatial model approach on deforestation of Java Island, Indonesia', *Geographic Information Systems, concept, methodologies, tools and applications,* vol. 6, no. 37, pp. 37-44.

Protschky, S 2011, Images of the Tropics: Environment and Visual Culture in Colonial Indonesia, KITLV Press, Leiden, Netherlands.

Rackham, O 1980, *Ancient Woodland: Its History, Vegetation and Uses in England,* Edward Arnold, London.

…… 2003, *Ancient woodland: its history, vegetation and uses in England.* 2nd edition, Castlepoint Press, Dalbeattie.

…… 2008, 'Ancient Woodlands: modern threats', *New Phytologist*, vol. 180, no. 3., pp. 571–586.

Ramos, B & Pastor, I 2012, 'Mapping the visual landscape quality in Europe using physical attributes', *Maps*, 8, 1, pp. 56-61.

Rayner, T 2004, Female factory female convicts: the story of the more then 13, 00 women exiled from Britain to Van Diemen's Land, Experance Press, Tasmania.

Reid, T 1822, *Two voyages to New South Wales and van Diemen's Land with description of the present condition of that interesting colony including facts and observations relative to the state and management of convicts of both sexes; also reflections on seduction and its general consequences*, Longman, London.

Rex, R 2012, *Lycett, Joseph (1774–1825),* Australian Dictionaryof Biography National Centre of biography Australian national University, viewed 29 October 2012, <http:adb.anu.edu.au/Lycett-joseph-2382/text317>.

Robertson, EG 1970, *Early Buildings of southern Tasmania*, EG, Robertson, Australia.

Robinson, PJ 2005, Ice and snow in paintings of Little Ice Age winters, *Weather*, vol. 60, no.2, pp. 37–41.

Robson, LA 1983, A History of Tasmania, Volumr 1: Van Diemen's Land from the earliest time to 1855, Oxford University Press, Melbourne.

Rollins, M 2003, 'The mind in pictures: perceptual strategies and the interpretation of visual art', *Monist*, vol. 86, no. 4, pp. 608-631.

Rose, G 1993, Feminism and geography: The limits of geographical knowledge, University of Minnesota Press.

Rose, SO 1993, Limited livelihoods: gender and class in the Nineteenth-century England, University of California press, California.

Rosenthal, M 1983, *Constable: the Painter and His Landscape*, New Haven Press, Yale University.

Ross, J 1832, *Statistics View of Van Diemen Land, comprising its geography, geology, climate, health and duration of life, divisions of the island, number of the houses, expernces*

of the people, manifacturers, habits,literature, amusement, roads, and public works up to the year 1831, forming a complete emigrants guide, viewed 5 Dec. 2012, <http://pi.lib.uchicago.edu/1001/cat/bib/ocm35069994>.

Rowcraft, C 1855, *Bush ranger of van Diemen land*, Harper and Brothers Publishers, New York.

Rydell, RW 1993, *World of Fairs*, The University of Chicago Press,Chicago.

Sayers, A 2001, *Austrlian Art*, Oxford Press, New York.

Schier, F 1986, *Deeper into pictures, an essay on pictorial representaion.* Cambpridge university press.

Schroeder, FEH 1993, Front yard America; the evolution and meanings of vernacular domestic landscape, Bowling Green University Popular Press.

Scott P, 1955, 'Hobart: an emergent city'*, Australian Geographer*, vol. 6, no. 4, pp. 19-31.

Scott, JW & Tilly, LA 1975, 'Women's work and the family in nineteenth-century Europe', *Comparative Studies in Society and History*, Vol. 17, No. 01, pp. 36-64.

Shaver, JC & Fisse, HG 1973*,* 'Evaluation of vegetation types differentiated by Aerial Photo Interpretation of Chromatic, Color, and Infra-Red Imagery'*, Technical report Plant division*, University of Wyoming, Wyoming.

Short, JR 1991, Imagined country: environment, culture, and society, Syracuse University Press.

Silbernagel, J 2005, 'Bio-regional patterns and spatial narratives for integrative landscape research and design', in B Tress (ed.), *From landscape research to landscape planning: aspects of integration, education and application*, Springer Science & Business Media, vol. 12, pp. 107-118

Sloan, K 1997, Industry from Idleness? The Rise of the amateur in the Eighteenth Century, in ML Rosenthal, C Payne & S Wilcox (eds), *Prospects for the Nation: recent essays in British landscape, 1750-1880,* Yale University Press, New Haven.

Smith, B 1960, European Vision and the South Pacific1768-1850: a study in the history of art and ideas, Oxford University Press, Oxford**.**

Smith, J 2013, 'the lie that blinds destabilizing the text of landscape', in, JS Duncan & D Ley (eds), *Place/culture/representation*, Routledge, pp. 78-92.

Spehr, M, Wallraven, C & Fleming, RW 2009, 'Image statistics for clustering paintings according to their visual appearance', in *Proceeding Computational Aesthetics in Graphics, Visualization, and Imaging,* Europgraphics Association, pp. 57-64.

Stan, D & Sethi, IK 2001, 'Image retrieval using a hierarchy of clusters', *Advances in Pattern Recognition-ICAPR.,* viewed 25 July 2012: <http://www.springerlink.com/content/j31m141l46lq0620>.

Staple, M 2003, 'Tasmania as little England and the social construction of landscape', *Rural Society*, vol. 13, no. 3, pp 312-329.

Stone, GM 1998, 'Forest-type mapping by photointerpretation: A multi-purpose base for Tasmania's forest management', *TasForests-Hobart*, vol. 10, 15-32.

Stork, DG & Johnson, MK 2006, 'Estimating the location of illuminants in realist master paintings Computer image analysis addresses a debate in art history of the Baroque', *Pattern Recognition,* vol. 1, pp. 255-258.

Sullivan, M 1962, *The birth of landscape painting in China*, University of California Press.

Terry, I 1999, A Favourable progression: Thematic history of south Hobart, Hobart City Council, Hobart.

Thomas, J 2006, 'Cultural climatology and the representation of sky, atmosphere, weather and climate in selected art works of Constable, Monet and Eliasson', *Geoforum*, pp. 570-580.

Thorne, JE 1999, *John Constable's skies a fusion of art and science*, University of Birmingham Press, Birmingham.

Timms, BF 2008, 'The parallax of landscape: situating Celaque National Park, Honduras', in DC Knudsen (ed.), *Landscape, tourism, and meaning*, Ashgate Publishing, Ltd.

Timms, P 2009, *In search of Hobart*, University of New South Wales Press, Sydney.

Townsend, JH 1995, 'Painting techniques and materials of Turner and other British artists 1775-1875', in A Wallert, A Hermens & M. Peek, *Historical painting techniques materials and studio practice*, the Getty Conservation Institute , University of Leiden, Netherland, pp. 176-185.

Tricaud, PM 2009, 'Cultural Landscapes management framework', in N Mitchell, R Mechtild & PM Tricaud, *World Heritage Cultural landscape: A Handbook for Conservation and Management*, paper 26, pp. 59.

Trigger, D 2003, 'Introduction', in DS Trigger & G Griffiths (eds), *Disputed territories: land, culture and identity in settler societies*, Hong Kong University Press, Vol. 1, pp. 1-28.

Trnkova, P 2011, 'Photography in the service of the aristocracy: the visual representation of the Buquoy Estate under Georg Johann Heinrich Buquoy in the mid-19th century', *Umeni-Art,* vol. 59, no. 2, pp. 145-60.

Tsukamoto, A 2009, 'Unfolding the landscape drawing method of Rakucho Rakugaizu screen paintings in a GIS environment', *An International Journal of Humanities and Arts Computing* , vol. 3, no. 1-2, pp. 39-60.

Underwood, EC, Ustin, SL & Ramirez, CM 2007, 'A comparison of spatial and spectral image resolution for mapping invasive plants in coastal California', *Environmental Management*, vol. 39, no. 1, pp. 63-83.

Van den Herik, HJ & Postma, EO 2000, 'Discovering the visual signature of painters', in N Kasabov (ed.), *Future Directions for Intelligent Systems and Information Sciences*, Springer-Verlag, pp. 129-47.

Walker, M 2008, 'The Switzerland of the South; Thomas Cook and the Institutionalisation of Tourism in Late Nineteenth Century Tasmania',*Tasmanian Historical Studies*, vol. 13, pp. 63-82.

Wein, JA 1981, 'The Parisian Training of American Women Artists', *Woman's Art*, vol. 2, no. 1, spring, pp.41-44, viewed 26 June 2012, <http://www.jstor.org/stable/1357900>.

Wells, L 2011, land matters landscape photgraphy culture and identity, I.B. TAURIS, New York.

Whyte, ID 2002, *Landscape and history since 1500*, Reaktion Books, London.

Wilcox, S 1997, 'Looking backward: Victorian perspectives on the romantic landscape watercolour', in ML Rosenthal, C Payne & S Wilcox (eds), *Prospects for the Nation: recent essays in British landscape, 1750-1880*, Yale University Press, New Haven, pp. 307-326.

Wilson, AR 1991, Environmental risk: identification and management, Lewis Publishers, Chelsea.

Wood, G 2007, 'Constable, Clouds, Climate Change', *Wordsworth Circle*, vol. 38, no.1-2, pp. 25-33.

Yates, CJ & Hobbs, RJ 1997, 'Temperate Eucalypt Woodlands: a Review of Their Status, Processes Threatening Their Persistence and Techniques for Restoration', *Australian Journal of Botany,* vol. 45, no. 6, pp. 949 – 973.

Zhang L 2013, 'Nature and landscape in Chinese tradition', in PK Cheng & J Fan (eds), *New perspectives on the research of Chinese culture*, Springer, Singapore, pp. 1-16.

Appendix A

Database of Artworks

No.	Artworks Information			Artist Information				
	Title of Art	Medium	Year	Name	Date	Gender	Profession	Place of birth/Origin
1	Mt Wellington Seen From Claremont	Watercolour	1883	Allport Curzona Frances Louise	1860-1949	Female	Artist	Tasmania
2	Mt Wellington From Kingston	Watercolour	1883	Allport Curzona Frances Louise	1860-1949	Female	Artist	Tasmania
3	Mt Direction	Drawing	1838	Allport Mary Morton	1806-1895	Female	Artist	England/lived in Tasmania
4	View From Mt Direction	Drawing	1838	Allport Mary Morton	1806-1895	Female	Artist	England/lived in Tasmania
5	Old Beach, Brighton	Drawing	1840	Allport Mary Morton	1806-1895	Female	Artist	England/lived in Tasmania
6	Aldridge Lodge VD Land Oct15th1842	Watercolour	1842	Allport Mary Morton	1806-1895	Female	Artist	England/lived in Tasmania
7	Coal Mine, Richmond	Watercolour	1842	Allport Mary Morton	1806-1895	Female	Artist	England/lived in Tasmania
8	Regatta From Sandy Bay	Watercolour	1842	Allport Mary Morton	1806-1895	Female	Artist	England/lived in Tasmania

No.	Artworks Information			Artist Information				
	Title of Art	Medium	Year	Name	Date	Gender	Profession	Place of birth/Origin
9	View From The Aldridge Lodge	Watercolour	1842	Allport Mary Morton	1806-1895	Female	Artist	England/lived in Tasmania
10	View Of The Derwent From The Garden Of Aldridge	Watercolour	1842	Allport Mary Morton	1806-1895	Female	Artist	England/lived in Tasmania
11	Old Gov. House Hobart Town	Watercolour	1845	Allport Mary Morton	1806-1895	Female	Artist	England/lived in Tasmania
12	Sketch Of Hobart Foreshore With Boats.	Watercolour	1845	Allport Mary Morton	1806-1895	Female	Artist	England/lived in Tasmania
13	Sketch Of Hobart Foreshore From Lower Sandy Bay	Watercolour	1845	Allport Mary Morton	1806-1895	Female	Artist	England/lived in Tasmania
14	Sunrise On Mt. Wellington	Watercolour	1845	Allport Mary Morton	1806-1895	Female	Artist	England/Tasmania
15	Houses At Uupper Liverpool Street, Hobart	Drawing	1850	Allport Mary Morton	1806-1895	Female	Artist	England/Tasmania
16	Kangaroo Point First Beach Bellerive	Watercolour	1850	Allport Mary Morton	1806-1895	Female	Artist	England/lived in Tasmania
17	Evett, Grouse	Drawing	1858	Allport Mary Morton	1806-1895	Female	Artist	England/lived in Tasmania

No.	Artworks Information			Artist Information				
	Title of Art	Medium	Year	Name	Date	Gender	Profession	Place of birth/Origin
18	From Kangaroo Point	Drawing	1835	Ashburner William Page	1791-1862	Male	Artist	USA/England
19	Mt Direction From New Town.	Watercolour	1889	Ashton Julian	1851-1942	Male	Artist	England/Australia
20	Old Wharf From Battery Point, Hobart	Watercolour	1889	Ashton Julian	1851-1942	Male	Artist	England/Australia
21	Kangaroo Point	Lithograph	1833	Atkinson Charles	1806-1837	Male	Government-Officer	England/Tasmania
22	The Barracks	Lithograph	1833	Atkinson Charles	1806-1837	Male	Government-Officer	England/Tasmania
23	The Seat Of His Excellency	Lithograph	1837	Atkinson Charles	1806-1837	Male	Government-Officer	England/Tasmania
24	Hobart Town	Watercolour	1825	Earle Augustus	1793-1838	Male	Artist	England/American
25	Hobart Town	Watercolour	1825	Earle Augustus	1793-1838	Male	Artist	England/American
26	Hobart Town	Watercolour	1825	Earle Augustus	1793-1838	Male	Artist	England/American
27	Hobart Town	Watercolour	1825	Earle Augustus	1793-1838	Male	Artist	England/American
28	Hobart Town	Watercolour	1825	Earle Augustus	1793-1838	Male	Artist	England/American
29	Hobart Town	Watercolour	1825	Earle Augustus	1793-1838	Male	Artist	England/American

No.	Artworks Information			Artist Information				
	Title of Art	Medium	Year	Name	Date	Gender	Profession	Place of birth/Origin
30	Hobart Town From Harbour	Watercolour	1827	Barthelemy Lauvergne	1805-1875	Male	Artist	France/Australia
31	The Derwent And Sandy Bay	Oil	1856	Beauchamp Robert Proctor	1802-1854	Male	Artist	England/Tasmania
32	Female Factory	Watercolour	1860	Beauchamp Robert Proctor	1819--1889	Male	Artist	England/Tasmania
33	Regatta Hobart	Watercolour	1852	Becker Ludwig	1808-1861	Male	Artist	Germany/Australia
34	Hobart Town From Eastern Side Of The Derwent.	Lithograph	1830	Bock Thomas	1790-1855	Male	Artist	England/Tasmania
35	Hobart From Artist Home.	Oil	1832	Bock Thomas	1767-1849	Male	Artist	England/Tasmania
36	The Old Jetty Hobart Town	Lithograph	1833	Bock Thomas	1790-1855	Male	Artist	England/Tasmania
37	View Of Mt Wellington From South Hobart	Oil	1834	Bock Thomas	1767-1851	Male	Artist	England/Tasmania
38	Observatory, Government House	Oil	1842	Bock Thomas	1790-1855	Male	Artist	England/Tasmania
39	Mount Wellington	Drawing	1856	Bowring Emily Stuart	1835-1912	Female	Artist	Tasmania
40	Government House	Drawing	1858	Bowring Emily Stuart	1835-1912	Female	Artist	Tasmania
41	The Derwent River And Government House.	Drawing	1858	Bowring Emily Stuart	1835-1912	Female	Artist	Tasmania

No.	Artworks Information			Artist Information				
	Title of Art	Medium	Year	Name	Date	Gender	Profession	Place of birth/Origin
42	Fernleigh With Mt Wellington	Watercolour	1840	Boyes George Thomas William Blamey	1787-1853	Male	Government-Officer	England/Tasmania
43	View From The Domain Northwest Across New Town Bay	Watercolour	1840	Boyes George Thomas William Blamey	1787-1853	Male	Government-Officer	England/Tasmania
44	Hobart From Mt Nelson	Watercolour	1841	Boyes George Thomas William Blamey	1787-1853	Male	Government-Officer	England/Tasmania
45	Hobart From East	Watercolour	1845	Boyes George Thomas William Blamey	1787-1853	Male	Government-Officer	England/Tasmania
46	Hobart From South West	Watercolour	1848	Boyes George Thomas William Blamey	1787-1853	Male	Government-Officer	England/Tasmania
47	Mt Wellington Shore-New Town	Watercolour	1850	Boyes George Thomas William Blamey	1787-1853	Male	Government-Officer	England/Tasmania
48	Hobart From Domain.	Oil	1854	Bull Knut	1811-1889	Male	convict	Norway/Tasmania
49	New Town.	Oil	1854	Bull Knut	1811-1889	Male	Artist	Norway/Tasmania
50	View Of Rossbank Observatory, Hobart	Oil	1854	Bull Knut	1811-1889	Male	Artist	Norway/Tasmania
51	Hobart Town And Mt Wellington	Oil	1855	Bull Knut	1811-1889	Male	Artist	Norway/Tasmania

No.	Artworks Information			Artist Information				
	Title of Art	Medium	Year	Name	Date	Gender	Profession	Place of birth/Origin
52	Entrance To The Derwent River From The Spring, Mt Wellington..	Oil	1856	Bull Knut	1811-1889	Male	Artist	Norway/Tasmania
53	View Of New Town From Augusta Rd.	Watercolour	1875	Burgess James Ogle	1880-1883	Male	Artist	England/Tasmania
54	View From Battery Point.	Watercolour	1845	Cumberland Burrell Charles	1828-?	Male	Artist	England/Tasmania
55	Hobart From The Corner Of Dewitt And Cromwell Streets.	Watercolour	1850	Cumberland Burrell Charles	1828-?	Male	Artist	England/Tasmania
56	A View Of Hobart Town.	Lithograph	1823	Carswell Alan	Nd	Male	Artist	Ireland/Tasmania
57	Hobart Town	Drawing	1834	Chapman Thomas Evans	1790-1864	Male	Artist	England/Tasmania
58	Richmond, Van Diemen's Land	Watercolour	1834	Chapman Thomas Evans	1790-1864	Male	Artist	England/Tasmania
59	New Wharf Hobart Town	Lithograph	1836	Chapman Thomas Evans	1790-1864	Male	Artist	England/Tasmania
60	In The Paddock Hobart Town	Drawing	1839	Chapman Thomas Evans	1790-1864	Male	Artist	England/Tasmania
61	View Of Mt Wellington From St. George’s Hill.	Watercolour	1848	Chapman Thomas Evans	1790-1864	Male	Artist	England/Tasmania
62	Kangaroo Bay.	Drawing	1852	Chapman Thomas Evans	1790-1864	Male	Artist	England/Tasmania

No.	Artworks Information			Artist Information				
	Title of Art	Medium	Year	Name	Date	Gender	Profession	Place of birth/Origin
63	New Town.	Drawing	1852	Chapman Thomas Evans	1790-1864	Male	Artist	England/Tasmania
64	View From Woodville Mt Direction.	Drawing	1855	Chapman Thomas Evans	1790-1864	Male	Artist	England/Tasmania
65	New Town Bay	Drawing	1859	Chapman Thomas Evans	1790-1864	Male	Artist	England/Tasmania
66	At Derwent Park ,New Town	Watercolour	1859	Chapman Thomas Evans	1790-1864	Male	Artist	England/Tasmania
67	From The Old Wharf, Hobarton	Drawing	1841	Chapman Thomas Evans	1790-1864	Male	Artist	England/Tasmania
68	Drawing Of Hobart Town	Drawing	1817	Charles Jeffries	1782-1826	Male	Government-Officer	England/Tasmania
69	Rade D'hobart	Lithograph	1840	Ciceri Eugene	1813-1890	Male	Artist	French
70	Gov. House, Risdon	Drawing	1850	Cleburne, Sarah Margaret	1829-1885	Female	Artist	Tasmania
71	Road To Mt Direction	Watercolour	1870	Cleburne, Sarah Margaret	1829-1885	Female	Artist	Tasmania
72	The Derwent -Risdon Cove	Watercolour	1870	Cleburne, Sarah Margaret	1829-1885	Female	Artist	Tasmania
73	The Derwent River From Old Beach	Watercolour	1870	Cleburne, Sarah Margaret	1829-1885	Female	Artist	Tasmania
74	View Of The Derwent.	Watercolour	1870	Cleburne, Sarah Margaret	1829-1885	Female	Artist	Tasmania

No.	Artworks Information			Artist Information				
	Title of Art	Medium	Year	Name	Date	Gender	Profession	Place of birth/Origin
75	View Of Mt Wellington.	Drawing	1886	Cook Ebenezer Wake	1844-1926	Male	Artist	England /Australia
76	Hobart Town.	Lithograph	1834	Davenport Samuel	1783-1867	Male	Artist	England
77	Hobart And Wharf Area From Hunter Street	Watercolour	1848	de Wesselow Simpkinson	1819-1906	Male	Government-Officer	England
78	Rossbank Observation.	Watercolour	1848	de Wesselow Simpkinson	1819-1906	Male	Government-Officer	England
79	View Of Hobart.	Watercolour	1854	de Wesselow Simpkinson	1819-1906	Male	Government-Officer	England
80	Derwent Water , Sandy Bay	Oil	1834	Duterrau Benjamin	1790-1855	Male	Artist	England/Tasmania
81	A View Of Hobart Town Form Kangaroo Point	Engraving	1836	Duterrau Benjamin	1767-1851	Male	Artist	England/Tasmania
82	Hobart Town From The Rock Below Kangaroo Bay	Lithograph	1844	Eaton Henry Green	1818-1887	Male	Artist	England/Australia
83	Hobart Town And Mt Wellington	Oil	1866	Evans, George Francis	1809-1895	Male	Artist	England
84	Mt Wellington From Risdon Cove	Drawing	1880	Evans, George Francis	1809-1895	Male	Artist	England
85	South-West Of Hobart Town 1819.	Watercolour	1819	Evans, George William	1780-1852	Male	Government-Officer	England/Tasmania
86	Southwest Of Hobart Town.	Watercolour	1819	Evans George William	1780-1852	Male	Government-Officer	England/Tasmania

No.	Artworks Information			Artist Information				
	Title of Art	Medium	Year	Name	Date	Gender	Profession	Place of birth/Origin
87	Hobart Town	Drawing	1820	Evans George William	1780-1852	Male	Government-Officer	England/Tasmania
88	Hobart Town	Watercolour	1821	Evans George William	1780-1852	Male	Government-Officer	England/Tasmania
89	Southwest View Of Hobart	Drawing	1823	Evans George William	1780-1852	Male	Government-Officer	England/Tasmania
90	View Of Sullivan's Cove	Watercolour	1804	Evans George William	1780-1852	Male	Government-Officer	England/Tasmania
91	Fish-market, Hobart	Oil	1894	Fleury, J.L.	1861-1947	Male	Artist	?
92	Mt Wellington And Hobart Harbour	Oil	1883	Forrest, Haughton	1826-1925	Male	Government-Officer	France/Tasmania
93	Hobart	Oil	1887	Forrest, Haughton	1826-1925	Male	Government-Officer	France/Tasmania
94	The Female Factory	Oil	1889	Forrest, Haughton	1826-1925	Male	Government-Officer	France/Tasmania
95	Cascade Brewery	Oil	1890	Forrest, Haughton	1826-1925	Male	Government-Officer	France/Tasmania
96	Hobart Town, Van Diemens Land	Watercolour	1827	Frankland, George	1800-1838	Male	Government-Officer	England/Tasmania
97	Hobart From Gregor Garden's	Oil	1886	Fullwood, Albert Henry	1863-1930	Male	Artist	England/Australia
98	Hobart Town And River Derwent	Oil	1831	Glover John	1767-1849	Male	Artist	England/Tasmania

No.	Artworks Information			Artist Information				
	Title of Art	Medium	Year	Name	Date	Gender	Profession	Place of birth/Origin
99	Mt Wellington And Hobart Town From Kangaroo Pt	Oil	1831	Glover John	1767-1849	Male	Artist	England/Tasmania
100	River Derwent From Risdon	Oil	1861	Glover John	1767-1849	Male	Artist	England/Tasmania
101	Lieutenant John Bowen And Party Arriving At Risdon	Watercolour	1860	Gregson, Thomas George	1798-1874	Male	Artist	England/Tasmaina
102	Derwent River	Oil	1856	Gritten Henry	1818-1873	Male	Artist	England/Tasmaina
103	Government House	Oil	1856	Gritten Henry	1818-1873	Male	Artist	England/Tasmaina
104	Main Road, New Town	Oil	1856	Gritten Henry	1818-1873	Male	Artist	England/Tasmaina
105	Mount Wellington	Oil	1856	Gritten Henry	1811-1889	Male	Artist	England/Tasmaina
106	Hobart Town	Lithograph	1833	Hostein Edouard Jean Marie	1804-1886	Male	Artist	French
107	Hobart Town In 1817	Drawing	1817	Jefferyes Charles	1782-1826	Male	Government-Officer	England
108	Wharfside, Hobart Town	Watercolour	1868	Jones David	1793-1873	Male	Artist	England/Australia
109	Vue d'Hobart Town Price De L'Est	Lithograph	1833	Koeppelin	1803-1884	Male	Artist	France
110	Logging South Of Hobart	Lithograph	1833	Leborne Louis	1796-1863	Male	Artist	France

No.	Artworks Information			Artist Information				
	Title of Art	Medium	Year	Name	Date	Gender	Profession	Place of birth/Origin
111	Hobart Town Vue Cote Du Mt Wellington	Lithograph	1842	Louise Le Breton	1818-1866	Male	Artist	France
112	George's Hill	Drawing	1886	Ludwig Sylvester	1847-1915	Male	Artist	Germany/Australia
113	Hobart From Kangaroo Point	Drawing	1886	Ludwig Sylvester	1847-1915	Male	Artist	Germany/Australia
114	Hobart From Mt Nelson	Drawing	1886	Ludwig Sylvester	1847-1915	Male	Artist	Germany/Australia
115	Mount Direction	Drawing	1886	Ludwig Sylvester	1847-1915	Male	Artist	Germany/Australia
116	Srpings At Mt Wellington	Drawing	1886	Ludwig Sylvester	1847-1915	Male	Artist	Germany/Australia
117	Mt Nelson And Sandy Bay, Near Hobart Town	Watercolour	1823	Lycett Joseph	1775-1828	Male	Convict	England
118	View From The Top Of Mt Nelsonwithhobartt	Watercolour	1823	Lycett Joseph	1775-1828	Male	Convict	England
119	Mt Nelson From Near Mulgrave Battery	Watercolour	1824	Lycett Joseph	1775-1828	Male	Convict	England
120	Roseneat Ferry	Watercolour	1824	Lycett Joseph	1775-1828	Male	Convict	England
121	View Of Hobart	Watercolour	1824	Lycett Joseph	1775-1828	Male	Convict	England
122	Distant View Of Hobart	Watercolour	1825	Lycett Joseph	1775-1828	Male	Convict	England

No.	Artworks Information			Artist Information				
	Title of Art	Medium	Year	Name	Date	Gender	Profession	Place of birth/Origin
123	Roseneat From The Eastside	Watercolour	1825	Lycett Joseph	1775-1828	Male	Convict	England
124	View Of Mt Wellington Near Hobart	Watercolour	1825	Lycett Joseph	1775-1828	Male	Convict	England
125	From Mess Room Window	Drawing	1844	Mansfield James William	1824-?	Male	Government-Officer	England
126	Hobart	Drawing	1844	Mansfield James William	1824-?	Male	Government-Officer	England
127	Hospital, Guardroom, Officersquarters	Drawing	1844	Mansfield James William	1824-?	Male	Government-Officer	England
128	Looking North West From Old Wharf	Drawing	1844	Mansfield James William	1824-?	Male	Government-Officer	England
129	Looking S-Eastover Hobarttownderwent	Drawing	1844	Mansfield James William	1824-?	Male	Government-Officer	England
130	Mtwellington Fromthe Oldwharfhobarttown	Drawing	1844	Mansfield James William	1824-?	Male	Government-Officer	England
131	Back View Old Wharf	Drawing	1844	Mansfield James William	1824-?	Male	Government-Officer	England
132	Barraks From My Window	Drawing	1844	Mansfield James William	1824-?	Male	Government-Officer	England
133	Hobart From Domain	Drawing	1844	Mansfield James William	1824-?	Male	Government-Officer	England
134	Hobart Town From Mt Nelson	Drawing	1844	Mansfield James William	1824-?	Male	Government-Officer	England
135	Hobart Town Looking South	Drawing	1844	Mansfield James William	1824-?	Male	Government-Officer	England

No.	Artworks Information			Artist Information				
	Title of Art	Medium	Year	Name	Date	Gender	Profession	Place of birth/Origin
136	Looknig East Hobart Town	Drawing	1844	Mansfield James William	1824-?	Male	Government-Officer	England
137	Hobart Town From The Domain	Drawing	1844	Mansfield James William	1824-?	Male	Government-Officer	England
138	Bellerive'rosney Golflinks'belllerivesunnyside	Drawing	1889	Mault Alfred	1829-1902	Male	Artist	Australia
139	Hobart Town	Lithograph	1841	Mayer Auguste Etienne Francois	1805-1890	Male	Artist	France
140	Hobart Town From Sandy Bay	Lithograph	1850	Mayer Auguste Etienne Francois	1805-1890	Male	Artist	France
141	Mt Wellington And Hobart	Drawing	1856	Meredith Louisa Anne	1812-1895	Female	Artist	England/Tasmania
142	Hobart Town, Mt Direction From Proctor Rd.	Drawing	1879	Meredith Louisa Anne	1812-1895	Female	Artist	England/Tasmania
143	New Town Bay	Watercolour	1898	Murray Alex Sutherland	1852-1902	Male	Artist	England/Australia
144	Off Hobart	Watercolour	1898	Murray Alex Sutherland	1852-1902	Male	Artist	England/Australia
145	Hobart And River Derwent	Watercolour	1899	Murray Alex Sutherland	1898-1899	Male	Artist	England/Australia
146	On The Derwent Near Hobarttown	Watercolour	1854	Nixon, Francis	1803-1879	Male	Artist	England/Italy
147	Lithograph Of Mt Wellington, Cascade, Hobar Town	Lithograph	1875	Piguenit, William Charles	1836-1914	Male	Government-Officer	Tasmania/Australia

No.	Artworks Information			Artist Information				
	Title of Art	Medium	Year	Name	Date	Gender	Profession	Place of birth/Origin
148	Mount Wellington From Kangaroo Bay, Tasmania	Oil	1875	Piguenit, William Charles	1836-1914	Male	Government-Officer	Tasmania/Australia
149	Mt Wellington From Risdon	Oil	1875	Piguenit, William Charles	1836-1914	Male	Government-Officer	Tasmania/Australia
150	View From Risdon	Oil	1875	Piguenit, William Charles	1809-1895	Male	Government-Officer	Tasmania/Australia
151	Hobart Looking North Across The Harbour	Drawing	1828	Prinsep, Augustus	1803-1830	Male	Artist	England/Sea
152	Hobart Town	Drawing	1829	Prinsep, A. Elizabeth	1804-1885	Female	Artist	England
153	Battery Point	Watercolour	1844	Prout-John Skinner	1805-1876	Male	Artist	England
154	Blackman Cove	Watercolour	1844	Prout-John Skinner	1805-1876	Male	Artist	England
155	Female Factory, Cascade	Watercolour	1844	Prout-John Skinner	1805-1876	Male	Artist	England
156	Governmet Paddock	Watercolour	1844	Prout-John Skinner	1805-1876	Male	Artist	England
157	Hobart From Kangaroo Point	Watercolour	1844	Prout-John Skinner	1805-1876	Male	Artist	England
158	Hobart From The Old Wharf	Watercolour	1844	Prout-John Skinner	1805-1876	Male	Artist	England
159	Hobart Town	Watercolour	1844	Prout-John Skinner	1805-1876	Male	Artist	England

No.	Artworks Information			Artist Information				
	Title of Art	Medium	Year	Name	Date	Gender	Profession	Place of birth/Origin
160	New Town And Mt Direction	Watercolour	1844	Prout-John Skinner	1805-1876	Male	Artist	England
161	Old Wharf	Watercolour	1844	Prout-John Skinner	1805-1876	Male	Artist	England
162	Restdown	Watercolour	1844	Prout-John Skinner	1805-1876	Male	Artist	England
163	Sandy Bay-1	Watercolour	1844	Prout-John Skinner	1805-1876	Male	Artist	England
164	Stgeorges, Mt Nelson	Watercolour	1844	Prout-John Skinner	1805-1876	Male	Artist	England
165	Thequeen'sorphanschool,Newtown	Watercolour	1844	Prout-John Skinner	1805-1876	Male	Artist	England
166	View Of Hobart From Mt Nelson	Watercolour	1844	Prout-John Skinner	1805-1876	Male	Artist	England
167	View St Georges Tre And Sandy Bay Rd-2	Watercolour	1844	Prout-John Skinner	1805-1876	Male	Artist	England
168	Hobart Revulet	Watercolour	1847	Prout-John Skinner	1805-1876	Male	Artist	England
169	Hobart, Van Diemen Land	Engraving	1830	Ross James	1786-1838	Male	Artist	England/Tasmania
170	View Of New Church	Engraving	1831	Ross James	1786-1838	Male	Artist	England/Tasmania
171	Vue Generale D'hobart Town	Drawing	1840	Sabatier,Jean B	nd-1887	Male	Government-Officer	French

No.	Artworks Information			Artist Information				
	Title of Art	Medium	Year	Name	Date	Gender	Profession	Place of birth/Origin
172	Hobart	Drawing	1853	Strange Frederick	1807-73	Male	Convict	England/Tasmania
173	The City Of Hobart From Knocklofty	Drawing	1854	Strange Frederick	1807-73	Male	Convict	England/Tasmania
174	River Derwent From Risdon	Oil	1861	Von Guérard Eugene	1819-1889	Male	Artist	Italy/Australia
175	Hobart Town	Oil	1856	Wood, James A.	1818-1873	Male	Artist	England